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JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. XLIII. XLIV 1917.

PART I.

THE HERBACEOUS BORDER.

By JOHN DICKSON, F.R.H.S.

[Read February 27, 1917; Mr. E. A. BOWLES, M.A., in the Chair.]

WITHIN the past twenty years, the number and quality of new introductions among herbaceous plants, the wonderful extension of their cultivation, the improved methods of exhibiting at shows, and the more tasteful and appropriate arrangements in gardens, have all reached a greater development than in any previous period of similar length.

With regard to new introductions from distant lands, we have had many which are valuable acquisitions, not only on account of their intrinsic charms, but because of their great possibilities and usefulness for hybridizing and cross-fertilizing purposes. China has proved a fertile source of treasures of which you have heard, read, and seen sufficient to render it superfluous for me to deal at length with them. In not a few cases the plant-breeder is provided with ample scope for the exercise of his skill in raising and selecting forms that in some feature or other shall be more suitable for British culture than the original types.

A good many of the Primulas, Androsaces, and Meconopses have peculiarities which have thus far prevented them making themselves quite at home, so to speak, in this country, but their extreme beauty warrants a deal of effort to try to improve them in the matter of hardiness, and it is my belief that this can be as well accomplished by

persevering selection as can improvements in size, colour, and other characteristics. We have already witnessed remarkable improvement in that elegant and floriferous little plant *Primula malacoides*, and although it may not be that every recent introduction would prove so accommodating as this little gem, I am convinced patient labour will be eventually rewarded in many directions.

In cross-breeding, too, we have already reaped the firstfruits of the use of some of the Chinese plants, and we have abundant material for further developments.

It is strange that, whilst some families of plants have been so vastly improved as to bear little resemblance to the old species and varieties that formed the foundation upon which the modern races have been built, other quite useful subjects have shown little or no advancement for many years; and it certainly seems to me that we might well relax our continuous efforts to add to the numbers of named varieties of such things as Delphiniums, Phloxes, Gaillardias, and Violas, in order to devote some attention to other subjects whose possibilities for development and improvement appear to have been overlooked. Is there, for instance, no possibility of producing new and improved varieties of so useful a plant as the Statice? We know the value of *Statice incana, tatarica,* and *latifolia*, which in a dried state have, until the present time of war, been an article of great commercial value to Germany, whence we annually imported large quantities. The Statices are familiar enough in herbaceous borders, and are not to be despised as garden plants apart from their uses for winter decoration; but could not our plant-breeders produce new varieties of even greater merits? The colours of most of them are of quiet and sombre shades, but the production of larger-flowered varieties with bright, distinct colours would enhance their value and endow them with infinitely greater interest. We have seen what has been done with Heucheras, mossy Saxifrages, and other simple flowers that have been taken in hand, but who knows the possibilities lying latent in Sempervivums, Sedums, Armerias, and numerous others that we seem to have been quite content to plant, but not to endeavour to improve?

In the matter of planning and arranging herbaceous borders, vast improvements have been made, the old straight lines of plants, graduated from the tall back row to the dwarfest-growing front row, have rightly given place to bold grouping in a freer and more pleasing style, and the studied arrangement of colour has resulted in the creation of borders of character and refinement. We still, however, too often come across arrangements of hardy plants that have the defect of periodical breaks in their effectiveness, and we are too familiar with the apologetic remarks with which an owner is wont to usher us into his garden, saying that had we only been a fortnight earlier we should have been delighted with the Pæonies or the Irises, now, alas, shorn of their splendour; or that, unfortunately, we are a bit too early to see the border at its best, since its main features are its Delphiniums,

Phloxes, or Pentstemons. To keep an ordinary border of herbaceous plants uniformly attractive from spring to autumn is extremely difficult, if not well-nigh impossible, and it is this fact which has caused the more formal summer-bedding of half-hardy plants to be adhered to in many private gardens and most public parks. Enthusiasts who have ample space and means can arrange a series of what are termed seasonal borders, devoting each to plants that bloom at a certain time—and there are several instances in the country where very attractive spring, summer, and autumn borders each in turn delight the eyes of owner and visitors alike. But in a small garden this is impossible, and as it is here the defects of the ordinary borders are most noticeable and vexatious, it becomes necessary and wise to call in the aid of other plants, and to adopt carefully thought-out schemes of arrangement. A judicious use of flowering shrubs, interspersed or grouped among the herbaceous plants, is of great value. The hardy Ericas, for instance, may be so arranged as to provide pleasing dashes of colour at seasons of the year when the colour is most wanted. The brooms, such as *Cytisus praecox*, give us some early blossom, and the berried Pernettyas are useful when other things are past. The handsome fruits of *Arbutus Unedo* will brighten a spot that has lost all other interest, and in the depth of winter the Wych Hazels will provide quaint flowers and delicious fragrance. To speak exhaustively of the charms and possibilities of the entire range of early-flowering shrubs would be too great a task even for the whole afternoon, but it must suffice to throw out simply the suggestion that those who take upon themselves the task of arranging and planting a garden should endeavour rather to mingle shrubs with herbaceous plants than to confine themselves entirely to the latter.

Again, I would strongly advocate the liberal use of hardy annuals, especially for the purpose of filling in vacant spaces where early-flowering plants have passed their effective stage, or late ones are still in the process of development. Of course it is necessary, when planting the permanent features, to work to a plan that provides room in convenient positions for these fill-gaps, and it is also advisable to make both autumn and spring sowings of the annuals in order to obtain both early and late flowers to meet all requirements. The sowing is best made in the reserve garden, so that the plants can be put out as required, and for this purpose I can strongly recommend the use of the paper or cardboard seed-raisers, which enable the plants to be transplanted without disturbance of the roots. Another method of planning a border capable of yielding good results is to carpet the ground with close-growing plants such as Aubrietias, Arabis, Forget-me-nots, *Saponaria ocymoides*, Violas, &c., and to intersperse somewhat thinly taller erect-growing subjects that will grow through without smothering the carpeting plants, and flower at various seasons. Such things as Anthericums, Camassias, *Liatris spicata*, *Michauxia campanuloides*, *Galtonia candicans*, Gladioli, and Lilies, are but a few suitable subjects for such arrangements, and whether in borders or in

isolated beds on grass, delightful effects can, with a little intelligent forethought, be thus secured.

For spring bedding there is no lack of hardy biennial and perennial plants that can be depended upon to make a good show. Polyanthus, double Daisies, Wallflowers, Aubrietias, Sedums, Hepaticas, and Anemones, are all too familiar to require any recommendation, but later in the season it is not so simple a matter to keep a bed neat and uniformly gay. Antirrhinums are of inestimable worth for this purpose, and are deservedly advancing in popularity year by year. There are plenty of good things that will produce a blaze of colour for a month or so; but for an isolated bed in a conspicuous position this is scarcely sufficient, except in the case of an establishment where the family are in residence for a short time only, and the bed can be timed to be in its prime just at the correct period. I have seen a bed planted with the compact little plant named *Chaenostoma hispida* which has been densely spangled with its small white starry flowers from May until October, and with a few dot plants of dark foliage such as the brilliant-flowered *Lobelia cardinalis* a striking effect is obtainable. *Gilia coronopifolia* is another suitable companion for the *Chaenostoma*, or even *Chelone barbata* or its variety *Torreyi*. *Nepeta Mussini* is another good bedding subject, and either a deep yellow or dark red flower of taller growth makes a good combination. Pentstemons are, of course, well known as good bedding plants, and I have recollections of a gorgeous show of colour produced by a large bed of a good strain of hybrid *Mimulus*, which also does remarkably well in the moist soil alongside a stream or pond.

Why is not more frequent use made of our hardy Fuchsias for bedding purposes? They are easily propagated from cuttings, and, if pinched and grown to convenient size in pots, they plant out as easily as Pelargoniums, and yield an abundance of bloom with no suggestion of stiffness or formality. St. Brigid Anemones can scarcely be over-estimated as subjects for bedding, and if the bed is first thinly planted in autumn, and a further batch of corms is interspersed a few weeks later, a prolonged season of flowering may be ensured.

Of the rock garden I cannot attempt to speak with any idea of doing justice to alpines in the time at my disposal. So big and engrossing a subject as alpine and rock gardening demands nothing less than an entire lecture; but I would like to say that, in my opinion, one should make up his mind to do one of two things—either set himself to the task of gathering together as varied a collection of the choicest gems and rarities of perennial plants, each individual of which is to be treated as a special treasure with an importance all its own, or else, if he aims at a rock garden of general effect, he should be satisfied to limit the variety of subjects, choosing only those of free growth and prolific flowering propensities, and planting these in broad masses, so that, viewed from any point of vantage, the eye may sweep over an undulating carpet of bold and effective colours.

THE CULTIVATION OF VEGETABLES.

By EDWIN BECKETT, V.M.H.

[Read March 13, 1917; Rev. J. JACOB in the Chair.]

THERE is no gainsaying that the increase of our food supplies must be of untold benefit to the community at any time, and especially in these critical days.

The writer of an article in one of our weeklies puts the matter very forcibly when he says that, for the very sake of the security of our national food supply, there is urgent need of a greatly increased production at home, and greater employment of men on agricultural land. He further states, what some of us have been emphasizing for years, that our home production of food is infinitesimal, and in the event of a successful blockade of our coasts we should soon be reduced to a state of starvation.

Home production of food would develop the country's resources, and so reduce our indebtedness to, and dependence upon, foreign lands. At the same time it would "colonize England," and give a much-needed stimulus to the decadent agricultural and horticultural industries.

It has recently been estimated that there are at least seventeen million acres of waste land in the British Isles, out of a total area of seventy-seven and a half million acres, and if only one-half of these, at present, unproductive acres could be brought under cultivation, an enormous benefit would accrue to the nation at large. This applies especially in the direction of vegetable cultivation, when it is considered that, in the years 1913 and 1914 respectively, no less than £6,000,000 and £5,500,000 worth of vegetables were imported from abroad, practically the whole of which could have been raised at home.

It was originally my intention to present for your consideration a paper on the cultivation of the culinary pea, but, after the strong appeals made by the Prime Minister and Mr. PROTHERO regarding food production, I ventured to write our Secretary suggesting that a more opportune subject would be Vegetable Cultivation, and I was exceedingly pleased to receive a reply from him concurring with the idea.

There are many who would do their share, and even more, in the national work of food production on allotment and small garden, who have only very vague ideas of commencing and advancing the cultivation and cropping of a plot of ground. These are the folk who need helpful advice from the members of the Royal Horticultural Society, and, even though all such members are experts, yet points

can be gleaned from each other, so that, in presenting my ideas in this paper at such a time, I need not, I feel certain, make any apology.

Preparation of Ground.—An old cookery recipe started with the words "First catch your hare, then cook it," and this could to-day be paraphrased into "First get your ground, then crop it." In between these two stages, however, lie the most important details of cultivation. The land may very likely be rough pasture land, or waste ground, or perhaps an old, long-worked garden, but in each and every case the secret of success is in the proper working of the soil. There is no question but that the most important operation is trenching (or soil-moving) to a depth, where possible, of from 2 feet 6 inches to 4 feet, with the object of draining and aerating this depth properly, in order to render it ideally workable and fruitful. I believe in bringing the subsoil to the surface, when trenching, in order to render the whole of top-spit and subsoil one homogeneous mass of good material, whatever its nature.

Of course, in this paper, where I mention trenching, I refer to the ideal and approved methods which should rightly be carried out in autumn or during the open weather in winter and early spring; but, unfortunately, owing to lack of man-power, much will have to be performed less well than it should be, and in many cases late, this year. The earlier, however, it can be done the better, in order to reap the highly beneficial actions of frost and wind, sun and rain. Where exact methods have to be abandoned, the best substitutes must be employed, and if we find an enthusiastic amateur, late in beginning, who is likely to be deterred from making a start owing to the labour of trenching, we must tell him to do his best. If he cannot find time to do by far the best thing for his ground, by trenching it deeply, induce him to double-dig, or even single-dig, his plot, as it will be more in the national interest to reap even a light increase by his labours than no crop at all.

When the area for cultivation is too large to be prepared by spade work, a small plough can be used to much advantage, but care should be taken, where ground is of the nature of rough pasture, to remove, by grubbing, wiry tussocks before such operations commence, or they will prove a source of very much trouble and extra labour in after days.

Double-digging, or bastard trenching, is carried out similarly to trenching proper, but only two spits deep. In single digging it is important that the spit of soil should be inverted as it is dug. I do not, of course, recommend the last method, but it can be employed by a late starter, for better this than nothing.

Drainage.—In conjunction with trenching, or deep digging, too much stress cannot be laid on the necessity of drainage of kitchen gardens, either by natural or artificial methods, to a depth to which the ground is worked. This will effectively prevent the soil from becoming water-logged and packed, and will keep it sweet, provided a good method of drainage having an efficient outlet is adopted.

My preference is for agricultural drain-pipes covered with coarse brick rubbish or gravel, or a combination of both. This method will prove serviceable and effective for a number of years.

Manuring.—This is a big subject which, for the purpose of this paper, must be confined to very narrow boundaries. Manuring in horticulture is a very important matter, nearly always a source of deep mystery to the average amateur cultivator, and even, in some cases, to professional gardeners. In dealing with the mystery, let us first of all consider the purposes of manuring.

What do we manure the ground for ? Manuring is for the purpose of rendering soil fertile or sweet, of a proper constituency for producing vegetable growth, and to supply those mineral salts necessary for feeding plants in which the particular soil being treated is deficient.

There are two main forms of manure, viz. Natural and Artificial. Under the former heading (Natural) I would group such as animal manure and guano, decayed vegetation, leaf-mould, and seaweed, and under the latter all forms of chemical manures, including wood ashes, lime, soot, &c.

Natural manure should be used in preference to artificial, as in this form the principal foods for plant life are found in their best forms, which are so difficult to reproduce or imitate, with effective results, in artificial manure.

Manures act in different ways according to the soil, and therefore care should be exercised in selecting the manure requisite for a plot. On heavy soil long stable litter is by far the best, as it helps to lighten the mass, and decaying vegetation will here assist, but on a light or sandy soil cow or pig manure is best, owing to its effectively combining with the loose earth, to make a suitable soil from which plants can properly obtain their nourishment.

The use of lime is a matter requiring careful consideration, as many soils contain it in some form or another, such as lime, chalk, limestone &c. If soil contains much lime, it is, of course, a waste of time and money to add more, but if there is a deficiency, it must be made up. A soil without sufficient lime is generally sour or acid ; this can be tested easily, as there are one or two simple tests which can be applied for soil acidity.

An old garden, which has for years been heavily manured, should, for a change, receive a good dressing of lime and wood ashes, be deeply trenched in autumn, if the soil is heavy, or in spring, if light, and it will be found to be re-established with the necessary cultural properties.

Quicklime destroys soil pests, and is very beneficial where members of the Brassica family suffer from "Clubbing."

Seaweed is as good as farm manure, and, where obtainable, should be applied fresh on heavy soils and in a partly decayed state to light or loamy soils.

Guano, or bird manure, is very rich, going eight times as far as horse manure, but care should be taken in storing it to keep it as air-

tight as possible, as it rapidly decomposes and loses its valuable properties when exposed.

So many excellent brands of patent manures are now sold that it would be invidious to mention any particular one. These manures are principally useful for applying during the free-growth period of a crop, and many will often act like magic in promoting development of plant life.

Rotation of Crops.—Most vegetables dislike cultivation for two successive seasons on the same site, and a little forethought is profitable in arranging the planting of crops. A good idea is to prepare a plan of the ground showing the arrangement of crops for three or four years, and work according to it. By a little care one crop can follow another, and find left in the soil just what is necessary for its food discarded by the previous crop, which has depended on other matter. For instance, Celery can be followed by Peas, which in turn can make way for Winter greens or Leeks, whilst Onions can succeed Cabbages, and so on.

All members of the Brassica family should, as far as possible, be planted on a fresh site each year, and it is advisable to allow a couple of seasons even to elapse before returning to the same place with any member of the tribe again. This remark also applies to Peas. If it is necessary, owing to lack of space, to return with the same crop, deep trenching should most certainly be resorted to prior to planting.

On the other hand, there are some vegetables which prove exceptions to the rule, and of these Onions, Leeks, Shallots, Artichokes, both Globe and Jerusalem, Horseradish, and Carrots will thrive well on the same site for a number of years. Potatos too, provided the land is deeply worked each winter, can be successfully grown on the same ground for several years, suitable enrichment being of course necessary.

Intercropping is a matter of considerable importance at the present time, when it is essential that all the return possible should be obtained from the soil. Many will now find their plot of ground restricted in size, but intercropping can be practised with very beneficial results.

I have been very much interested in intensive culture for many years past, and have managed to find a certain amount of time for experimental intercropping. A brief account of intercropping on a small plot of ground, measuring about a hundred yards long and twelve yards wide, undertaken last year, may prove interesting, as showing what can be done to produce vegetables all the year round.

The plot had been trenched three feet deep the previous season, to obtain the highest results from deep tillage and drainage, and we had reaped splendid crops of Cauliflowers and Broccoli from it. Early last year a small plough was obtained, as shortage of labour, combined with a wet early spring, effectively prevented any attempt at spade-work. The plough was a success on this plot and other land near by.

The land was first thoroughly dressed with decomposed garden refuse, ploughed twice during March, and then harrowed down to a fine tilth. About the middle of April Cauliflowers were set out in

rows, 3 feet apart, with 2 feet 6 inches between the plants. On each side of the plot a row of Peas, running east and west, was grown. On June 8, in the same rows as the Cauliflowers, between the plants, Brussels Sprouts and Victoria Kale were planted, whilst *between* the rows Leeks were put in at one foot apart for six rows, and Turnips were sown between the remaining rows. As the Cauliflowers matured, they were cut, the ground cleared and deeply hoed.

The whole result was absolutely satisfactory, and the Brussels Sprouts &c. have been, and are still, a first-rate crop.

This idea can, of course, be extended, altered, and elaborated upon in various ways, but it serves to illustrate what can be done in the direction of intensive cultivation.

Sowing, Thinning, and Planting.—The word "intensive" calls to mind what is far too often a fault in vegetable culture, the overcrowding of plants. Too frequently do we see poor, struggling crops suffering from the mistake of planting too closely together, and with insufficient space between rows, and especially so is this the case with Peas and Beans, vegetables which people usually sow far too thickly. Not only does this thick sowing waste seed and labour, but it has the damaging effect of weakening the seedlings, and they never recover from this. A good rule is to only sow twice as thickly as plants are to grow and thin out when the seedlings are quite small.

When sowing small seeds, the soil should be raked down to a fine tilth, and the seeds only covered by their own depth of soil. It is profitable at the time of sowing to take the necessary steps to keep off enemies such as slugs, birds, mice, rats, and ground game.

To plant out efficiently, practice and care are required. The seedlings must be carefully handled, planted with the aid of a trowel, some of the finest soil worked round the roots, and the ground made firm, but left loose at the ground level to prevent the seedlings damping off. The plants should be watered in at once, and if necessary, shaded until established.

In all well-ordered gardens, large or small, the crops should be correctly labelled as they are planted or sown. Ordinary wooden labels 15 to 20 inches long, and from 1 inch to $1\frac{1}{2}$ inches wide, are most useful. Paint each with a coat of white paint, and write the name on with a pencil whilst the paint is moist, adding date of sowing or planting, and seedsman's name for reference.

Hoeing, Mulching, and Watering.—These three operations are very closely connected, and are very important. By keeping the hoe constantly at work between growing crops, the troublesome weeds are defeated and destroyed, whilst the top soil receives that great benefit—aeration; also the soil, when in a finely broken, loose state, retains moisture far better and does not crack like unattended soil.

Mulching is resorted to as a means of conserving moisture during hot, dry weather, and the operation consists of spreading a good layer of long stable litter, or similar material, about growing crops. It is of considerable advantage, from the point of view of keeping the soil

moist, if the latter is well hoed first, and watered, prior to mulching, then much labour is saved with the watering-pot when the sun burns down and the wanted rain does not come.

I referred just now to watering. Here is where many cultivators fail. Where seedling vegetables are in frames prior to planting out, water very carefully and air freely, or serious damping off will occur; the soil also will sour if these precautions are not exercised, and it is far better to stint the plants slightly than to over-soak them. When plants are set out in their final growing ground, and the dry weather comes along, then give the plants a proper soaking now and again; a light sprinkling every day will do the plants very little, if any, good, as it is deep at the roots that plants require water.

An occasional good soaking with manure water, during the period of active growth, will do many plants a lot of good, and this applies especially to Cauliflowers, Celery, Leeks, Peas, Beans of all kinds, and Vegetable Marrows.

Tools and their Upkeep.—It is always a mistake to endeavour to make shift with a short supply of tools, and, when purchasing them, see that they are the best obtainable, as such are always the cheapest in the long run. Another important point to remember is, to keep them in good condition. See that they are properly cleaned at the end of the day's work. Never put them away with wet, sticky soil adhering to them, but clean it off, and wipe the damp parts of the tool with an oily rag to preserve it in a good condition. No workman can do himself justice with defective instruments, and one always sees that the better the workman the better kept are his tools.

The Use of Frames.—Big growers, of course, realize the value of frames for early supplies and preparatory work for the main crops, but, unfortunately, the amateur generally does not, and it is remarkable how many allotment grounds and gardens are without a frame on them. The cold frame is by no means difficult to manage, and repays its cost by the saving reaped through its utility.

In the early part of the year seeds can be brought on ready for planting out, and here especially the tyro will benefit, as with good seeds he gets good stock, whilst too often does he rely on the local nurserymen with bad or inferior stocks of too frequently dried-up plants.

Later in the year the frame can be utilized for various crops, such as Cucumbers, Melons, Tomatos, and late-sown Carrots, &c., whilst in late autumn and winter the frame can again be used for many kinds of vegetables which require a certain amount of protection.

The Soil Shed.—A shed should always be set aside, in a well-ordered garden, for storing the various soils and manures, so that they are ready to hand as required from time to time. This shed must always be kept well-drained and tidy, and a neat cleanly soil shed is by no means an unsightly portion of a garden, provided that it is well looked after, but, if allowed to get untidy, it can prove a very bad eyesore indeed.

General Remarks.—Never purchase seeds because they seem cheap. A good strain of seed from a reliable seedsman is always the most economical in the end. Slovenly work in a garden always entails a lot of after-labour. All work should be as effectively and tidily done as possible, and there should be a place for everything and everything in its place; especially does this apply to tools.

Stake heavy-topped vegetables, so as to support the stem, as no plant can do its best whilst one side is pressed down to the ground.

Always endeavour not to be late in planting or sowing, as a week late will possibly make every difference in the world when it comes to the harvest time for crops. Whilst bearing this carefully in mind, care should yet be observed not to sow seeds in the open under conditions of weather and soil which are such that germination cannot effectively occur, or time, labour, and seed will be wasted.

Cultural Details.—It is now my desire to occupy your attention with slightly more detailed points on the cultivation of various vegetables, confining myself to those kinds which are of most value as food during these critical days. Crops like Peas, Beans, Asparagus, &c., I propose to omit, as these can hardly be classed as utility vegetables.

The Potato.—Unquestionably this must be considered the premier vegetable food of the British Isles, and, despite the fact that many hold the opinion that Potato-planting may be overdone, my advice is that they should be planted freely during the coming season, from a national point of view.

Prepare the ground well by deep working. Procure the varieties which do best in the particular district where they are to grow, and use well-prepared seed, if possible greened and sprouted before they are put into the ground. Too great stress cannot be laid on these last two points, for it is little short of marvellous the difference in the crops from properly prepared sets, as against the produce of seed taken direct from heaps, or clamps, and put straight into the ground. Too many, however, neglect these preliminary details.

When planting, allow plenty of room between the rows and sets, as overcrowding is a frequent aid to the spreading of disease. The rows should be 3 feet apart for strong-growing varieties, with about 20 inches between sets. The space between is not waste, as, when earthing up is finished, the furrow left can be planted with Brussels Sprouts, various Brassicas, &c.

When the haulm appears, keep the hoe busy earthing up the rows; this is one of the most important items of Potato-growing.

Lift the crop early, as it is far better to dig it rather under-ripe than over-ripe and disease-infected. If some of the tubers get surface-rubbed in lifting, it will make no difference, as they form a new skin very rapidly where the old skin is damaged. This I have proved over and over again.

Onion.—Next to the Potato, in importance, comes the Onion, and this year their cultivation will doubtless be enormously increased.

In the past we have depended far too much on importations from abroad, for our soil and climate are ideal, where proper cultural methods obtain. I consider the best way is to sow in boxes, or cool frames, from early February to the middle of that month, scattering the seed thinly, and, when the plants reach a suitable size, put them out, after well hardening, into well-prepared ground of fine tilth, about 15 inches apart from row to row, and four inches from plant to plant. Make the ground firm, and well water in. Onions are very hardy, and, if well prepared, no frost after the beginning of April should harm them. By this method of treatment, the bulbs mature earlier, and are better for keeping purposes. They also escape the Onion Fly's unwelcome attention, produce a heavier crop, and enable the ground to be cleared for other crops much sooner.

Carrot.—Unless the ground is suitable for growing Carrots, it is much better to raise other crops in their stead, as in many districts the Carrot refuses to thrive. Where it will grow well, it should be raised extensively, owing to the continual demand for it.

Cabbage.—The utility of the Cabbage is unequalled amongst green vegetables. It is available for use all the year round, in some form or another, and, where various sowings are made, a garden need never be without a supply. Another thing to commend it is, that it is one of the easiest forms of vegetable to grow; anyone can raise it, even the veriest novice hardly being able to fail.

Parsnip.—This is one of the most desirable vegetables to cultivate. It is highly nutritious, but requires a long period of growth, and should be started, if possible, in February. The soil should not be too rich, but requires to be deeply worked. Avoid the older varieties, as there is no comparison between them and the newer and better kinds.

Brussels Sprouts.—No garden should be without Brussels Sprouts, for they are one of the most hardy and prolific vegetables for winter use. To obtain a succession of firm succulent Sprouts from September until the end of March two sowings should be made, one in March, and the other at the end of April.

Celery.—This is one of our most wholesome and delicious vegetables. It is always in good demand, and of the highest value as food, both cooked and raw. There is, in my opinion, no crop that benefits and improves the ground more, leaving it in a fine condition for crops following it. Its native home, whilst in a wild state, is a damp swampy place, or a ditch bottom, and consequently Celery always requires a deal of moisture, and especially in the seedling stage, dryness then being a common cause of failure in cultivation. Too early sowing also has a bad effect, resulting in premature flowering. The second week in February is the earliest that seed should be sown. For winter crops grow a red or pink variety, as they are more hardy than the white. Choose the seed from a reliable firm, and make sure they are a good variety, as there are so many worthless sorts on the market.

Celeriac (Turnip-Rooted Celery).—In this country Celeriac deserves

far more extended cultivation. It is wholesome, appetizing, and nutritious, with a flavour between those of Celery and Parsnip, and in the young stage should be treated in the same way as the former, but grown on flat ground. The soil requires deeply working, nd should be heavily manured. It requires abundance of water—ı fact, it can hardly have too much; and the Dutch hoe should be usy, periodically, on the soil round about it. Lift in autumn for toring in dry ashes, or sand, and it will keep good all the winter.

Beetroot.—An ideal site for Beet-growing is the plot from which elery has been lifted. It is, perhaps, not such an important vegetable s many others, but is such a favourite that some should be grown ı every garden.

Borecole or Kale.—Taken as a group, there are no vegetables rown that are so valuable, in the winter months, for supplies as re the Borecoles or Kales, and, from a productive standpoint, they ave no equals throughout winter and spring. They are very hardy, esisting long sharp frosts, and are delicious in flavour. The est kinds are the Scotch and Cottager varieties, and these should e seen in every garden, never mind how small. They are not articular with regard to their location, or the soil they are grown in, rovided it is well worked, and they will succeed in anything, from the ightest loam to the heaviest clay, though they are found at their best n soils of a heavy texture. It is a valuable vegetable for intensive ulture schemes, but requires a sharp watch to be kept for "Club Root" disease.

The true Labrador Kale is distinct, very prolific, and of quality nequalled.

Savoy.—Another hardy member of the Brassica family, valuable n mid-winter, as it is a good frost-resister; in fact, it is certainly better n flavour if cut after a frost. A common source of failure is too early owing, which causes the crop to be spoiled before the middle of vinter arrives. It should be at its best during January and February, nd, to ensure this, should not be sown before the second week in April, the first sowing being followed about three weeks later by nother.

Leek.—Our Scottish friends can still teach us much regarding he value of Leeks. The plants are extremely hardy, as no amount f frost harms them; they can be had for culinary use from August o April, and when well grown, and properly served, are very appeizing, and not outclassed by any other rival in the vegetable world. Every garden should contain Leeks, and gardeners should grow more han they do.

Mushroom.—These are an extremely palatable food, making choice substitute for more substantial dishes, and are always n large demand. Wherever fresh horse-manure is obtainable, they hould be grown, either under cover, or in the open.

Chicory.—We should certainly cultivate this more extensively; n the Continent it is very largely grown, and is a valuable vegetable

in both cooked and raw states. It requires sowing in spring on well-prepared ground, and should be lifted and blanched in a cellar, or mushroom-house, during the winter, at any time.

Pumpkin.—Unfortunately, this is a vegetable the culture of which is much neglected, though it is undoubtedly of high food value. To cultivate it is far from difficult, as its main essential is a sunny position, and, this attained, it can be grown, even on a rubbish-heap. Pumpkins need not occupy much space, for they can be trained up a wall or a pergola, and, in fact, are really ornamental in their growth.

When the fruit begins to swell, it must be exposed to the sun, and when cut should be stored in a dry, frost-proof room for winter use, when, if cut like a cheese, a Pumpkin will keep in a perfectly good condition for two or three weeks, provided that it has properly ripened.

Spinach Beet (Perpetual Spinach).—Though not generally considered a very high-class vegetable, yet, on account of its prolific habits, giving supplies throughout the year, it should be largely grown. Sow about the middle of March, and thin seedlings to 9 inches apart. When the leaves, which are the edible portion, are ready to pick, the plants will continue to supply fresh leaves for fully twelve months. Nicely cooked, this vegetable is very similar indeed to ordinary Spinach.

Turnip.—During autumn and winter the root portion, and during spring the greens, of both white and yellow varieties of Turnips and Swedes are very valuable as food, though possibly not so nutritious as other vegetables. To obtain best supplies for winter, Turnips should not be sown before the end of August, or the beginning of the following month.

Tomato.—It may appear strange to include the Tomato in a list of war-time vegetables, for most people look on it rather as a luxury, but there is a reason for so doing. In the hot days of summer and autumn a well-ripened Tomato, either with a moderate amount of cold meat or even without it, will make a good and satisfying meal. Consequently, they should appear in every garden, either under glass or trained against a wall or building. In my opinion the finest variety yet produced is 'Sunrise,' whilst its golden sport, 'Golden Sunrise,' is the best yellow variety we have.

Kohl-Rabi.—The mystery member of the Brassica family is one which, during the critical times ahead, may well prove its value as a food. It is not generally cultivated in Great Britain, except on farms for cattle-feeding, but when it is about the size of a turnip it is very nice for culinary purposes, and should undoubtedly be grown everywhere now, especially on hot dry soils, which suit the Kohl-Rabi well.

Vegetable Marrow.—Everyone who has a little space of ground should grow Marrows. Endeavour to start the plants early on a mild hot-bed, in portable frames, in order to make the productive season of as long duration as possible. The frames can be moved away when safe to leave the plants without their protection.

Ripe fruit can be stored and used in much the same way as

pumpkins, and they are also useful in making a very excellent and favourite jam.

Jerusalem Artichokes.—These, when nicely cooked and served well, make an admirable Potato substitute, and are perhaps the easiest of all vegetables to grow, as well as one of the most profitable. Once the seed tubers are put into the ground, the plants require practically no attention, and will thrive in any soil. Owing to its strong and handsome foliage, it is of much utility as a screen to hide unsightly spots, and so proves itself useful in a dual capacity. For culinary purposes, the white variety is far preferable to the red kind.

VIOLETS AND THEIR CULTIVATION.

By J. C. HOUSE, F.R.H.S

[Read March 27, 1917; Mr. E. H. JENKINS in the Chair.]

THE Sweet Violet, *Viola odorata*, is found all over Europe and in many parts of Asia, and also in North Africa. It was noticed by travellers a hundred years ago, in Palestine, China, Japan, and Barbary.

The first notice of the cultivation of Violets, as far as I am able to discover, is a statement by THEOPHRASTUS, that they were grown and sold in Athens about the time of the destruction of Herculaneum and Pompeii. HASSELQUIST says that the Sorbet of the Turks is prepared from Violets and sugar. HOOKER had heard that Highland ladies prepared a cosmetic from Violets, and he wonders how they obtained the blossoms, as the Violet is rarely found in the Highlands of Scotland. "Yet," he says, "the plant was known to them, if the following lines given by LIGHTFOOT are correctly translated from the Gaelic: 'Anoint thy face with goat's milk in which Violets have been infused, and there is not a young prince upon earth who will not be charmed with thy beauty.'"

Viola odorata in colour is white, deep purple, and occasionally lilac or reddish purple. It is the parent of the Sweet Violets in cultivation to-day. LOUDON says that the Neapolitan Violet is a variety of *V. odorata.*

In JOHN MILLER's catalogue, published in Bristol in 1826, I find four double Violets offered—white, blue, mauve, and purple. In WM. ROLLISSON's catalogue, 1875, I find seven Violets offered, six of which are doubles.

In the early Victorian period, Violets were cultivated more largely in Italy and France than in this country. In the neighbourhood of Bath, in the 'forties and 'fifties, there were a few rather extensive and successful cultivators. They sold their produce in the Bath and Bristol markets. Their varieties were the single Russian, the double Neapolitan, and a variety which they called *arborea.* They cultivated this in pots. It was a fine dark double purple, and very fragrant. It has appeared under several names, but I think there was no justification for calling it *arborea.* They had a knack of growing a crown on the end of a runner, and training it in the shape of a little umbrella. I think it is still offered by MILLET under the name of *arborea.* It is very much like 'King of Violets' or 'Bertha Barron,' and I think both of these varieties could be grown in this fashion without much trouble.

For many years the only single Violet in commerce in this country

was the Russian form of *odorata*, afterwards called 'The Czar.' About 1860 or 1870 a man named GEO. LEE, who lived at Clevedon, in Somerset, sent out a Violet which he called 'Victoria Regina.' He said that he believed the mice had sown the seed. 'Victoria Regina' was a distinct advance on 'The Czar.' It was more highly developed in form, better in colour, and flowered freely in autumn. For several years LEE made a practice of sending a big bunch of 'Victoria Regina' to her Majesty Queen Victoria at Balmoral, and these gifts were always acknowledged. I think LEE also gave us *odoratissima*. The old man died a few years ago at the age of ninety-seven. I never met him, but he used to send his good wishes to me as being a kindred spirit in some ways.

Wellsiana made its appearance shortly after 'Victoria Regina,' which it somewhat resembled. Its chief merit, however, is to be found in the fact that it begins to flower quite early in the autumn.

'Marie Louise' has been known under many names on the Continent of Europe for sixty years. SCHUER of Heidelberg advertised it as the best Violet of the Parma class.

There is a note in the *Gardeners' Chronicle* for 1884 respecting 'Lady Hume Campbell.' It was stated that the Violet had been brought from abroad several years earlier by Lady H. CAMPBELL and planted in her garden at Highgrove. Mr. TURNER noticed it there, and, I believe, purchased the stock.

A great stimulus was given to Violet culture by the appearance of 'California,' an American introduction, the first of the giant Violets. This was followed quickly by 'Princess of Wales,' which appeared from several sources under several different names.

I think that is quite enough about the early history of Violets, the rest is probably within your memory.

There are a few flowers which will probably command undying popularity. The number is strictly limited, but the Violet holds a prominent place amongst the favoured few. A handful of 'La France' Violets, grown to their fullest capacity, will probably hold its own with anything which can be produced in the stove or the orchid-house. The form of a well-grown, highly developed single Violet is exceedingly beautiful; the season at which Violets naturally bloom is the season when flowers are most highly prized; but the outstanding charm of the Violet is its incomparable fragrance. The sweetest-scented Violets in my judgment are *argentiflora*, *semperflorens* (or 'Quatre Saisons'), 'Neapolitan,' and 'Mrs. J. J. Astor.' The complaint is often made that the giant Violets are not so highly fragrant as the smaller varieties. I think people say this for the same reason that they say "It's too good to be true." It may be—but I am not sure of it—that what we have gained in size and form we have lost in perfume. This thought is an old one with many of us. In strawberries we gained in flavour in 'Dr. Hogg' and 'British Queen,' but we lost in beauty of berry and vigour of plant. The same thing is true in apples. 'Ribston Pippin' and

'Cornish Gilliflower' are not the most attractive in appearance, but there is no question about their flavour. So it may be that we have lost something in fragrance in the giant Violets; but, as I said before, I am not sure. In the days of our childhood we gathered Violets in the garden of our old home, and we shall never forget the fragrance of those days. Perhaps our sense of smell is not so keen as it was thirty years ago, or perhaps we *buy* our Violets now, and that makes all the difference. But with regard to the perfume of the giant Violets, I mention two or three facts which I have noticed.

Vases which have held the blooms will retain their scent for weeks after the flowers have been removed.

In a crowded Chrysanthemum show, I have often heard people say, "Oh, where are the Violets?" when I have been standing by one of our exhibits. And a flower-show is a difficult place to determine particular perfumes.

I remember hearing my father say that he went to the parcel office at Paddington for a box of Violet blooms, and the man in charge told him they had not arrived. But my father was perfectly sure he could smell them, and presently they were found.

But there is some other subtle, indefinable charm about Violets. When I was a boy at a school near Bath, I remember that we would almost fight over the first white Violet in the Claverton hedgerows. There was no other flower which we boys loved quite as much as we loved this flower.

You will want me to say something about the cultivation of Violets. Well, at the outset, if you are half as much excited about Violets as I was twenty years ago, you will make them grow by hook or by crook. How often people have said to me, "Ah, but you have some secret about Violet growing, and that is why you succeed." Well, I had a secret, I was in love with them—I still am, but I fear that in the last twenty years I have carried on a wild flirtation with Sweet Peas and Alpine plants. And a few other sweethearts were beginning to find a place in my rather susceptible affections when the war broke out, and we have had to look rather coldly on these darlings of ours ever since. We have been forced to make friends with *Solanum tuberosum*, and I have thought several times these last few days that it would have been far more sensible for the R.H.S. to come to Westbury-on-Trym and help me with my potato-planting, than for me to journey up to London to lecture on Violets.

Well, we will one day be reconciled to our old sweethearts, and go back to our peaceful gardens once again, when the turmoil of these war days is ended.

To grow Violets successfully, I think you must have a tolerably clear atmosphere. I do not think I have ever seen Violets doing well in a town. The growers at Hampton told me fifteen years ago that they could not grow Violets at Hampton, though, fifteen years before that, Hampton was, I think, the chief Violet locality for the London markets.

Violets will not thrive for any length of time in stiff, heavy soils, and I do not think it is possible to obtain the best results on light, dry, or sandy soil. If the character of your soil approaches either of these extremes, it will repay you to make a plot for your Violets. In Mr. B. T. GALLOWAY's little book on Violet cultivation, he says: "We may have in one part of a field a soil containing 15 per cent. to 20 per cent. of clay, and in another one containing 4 per cent. or 5 per cent. By mixing these two soils in equal proportion a combination is effected which, other conditions being equal, will prove better for Violets than either soil used alone." I agree with that.

The best way to propagate Violets is by rooting runners in the autumn months. Where Violets flourish, runners will be produced in great abundance. The stoutest and shortest jointed should be selected, and taken from the plants when they are 3 or 4 inches in length. Dibble the cuttings in light sandy soil, in a frame, facing south, and let the bed be as near to the glass as possible. They will root rapidly if you will give them the usual treatment required by cuttings under such conditions, and when once rooted they may be freely supplied with light and air. Wet will injure them more than cold, but the frames should seldom if ever be kept quite close.

In early spring, as soon as the weather will allow of it, the young plants should be lifted and a selection made. The long, stringy plants, and those which show no disposition to form a crown, should be rejected; the short, stiff, and stocky plants being lined in again to make a little more root and to receive protection from the bitter east winds which we often get in the month of March.

The planting out may be done as early as the middle of April. A cool, fairly moist situation is desirable. I used to argue for a partially shaded position, such as the north side of a garden wall. In such a position I have seen them do exceedingly well. But although this may not be indispensable, I am sure that they will require to be cool and moist at the roots during the growing season. The distance from plant to plant will vary from 10 inches for 'Lady H. Campbell' to 16 inches for 'Princess of Wales' and 'Luxonne.' I can tell you in a very few words what are the chief requirements of Violets from May to September. Scuffle with a Dutch hoe every few days during dry weather. Dust a little old soot over the plants every ten days or so, and spray the Violets with soft water as often as you like at the close of a hot day; and cut off the runners as soon as they appear. We used to plant our Violets in beds of such a shape and size that eight or ten 6 × 4 pit lights would nicely cover the beds. We would run an 8-inch board round the beds to support the lights, and thus save ourselves the trouble of lifting the Violets into frames. The finest blooms we ever exhibited were gathered from these undisturbed plants. That plan of course is not always feasible. Violets may be lifted into frames from August to October. I should say the first week in September was the ideal time. Do not lift too soon, do not feed too highly, do not nurse too tenderly. The aspect of the frames should

be south or south-west, for whilst it is quite possible for Violets to get too much sun in summer, it is impossible to give them more than enough in winter.

The compost should contain some leaf soil and sand, and if any thoroughly rotten stable manure be available, a small quantity may be added to the other ingredients, the chief element, of course, being good ordinary loam. Plant the Violets firmly, and so arrange the soil that the top leaves will almost touch the glass.

The distances will vary from 9 or 10 inches for the doubles to 12 or 14 inches for the singles.

They may be kept tolerably close for a day or two, until the roots begin to move, then the more air they receive the better they will thrive. The chief use of the lights is to keep off the excessive rains. Too much water in winter will do Violets more harm than a little frost, and the only protection required in an English climate can be obtained by spreading Russian mats over the lights on the coldest nights.

During the winter months remove all yellow and decaying leaves, and keep everything sweet and clean, stirring up the surface occasionally, and top-dressing the beds now and then with a mixture of soot and fine soil. When compelled to water, let it be done on a mild morning, and do not wet the leaves more than is necessary.

With regard to the hardiness of Violets, the more highly developed varieties are less hardy than the old sorts. The 'California' and 'Luxonne' family are hardier than the 'Princess of Wales' and 'La France' group. 'Noelie' is very hardy, and very useful for cold localities. The doubles of *odorata* type, such as 'Belle de Chatenay' and 'Bertha Barron,' are much hardier than the Parma doubles.

I very much question whether LOUDON was right in suggesting that the Neapolitan and Parma Violets are varieties of *odorata*. Neapolitan doubles sometimes go single, and the whole character of he Neapolitan family is distinct from the hardy single Violets of our early recollections.

VARIETIES.

I suppose I could give you a hundred names and descriptions; but is it wise in these days, when we are eliminating all unnecessary things?

The following, as far as I know, are the best sorts yet raised.

Singles.

'La France.' A giant Violet, compact in habit, and of rich deep colour.

'Princess of Wales.' Longer in stem than 'La France,' but not quite so rich in colour.

'Noelie.' A good hardy Violet, which flowers freely about Christmas with very little assistance.

'Queen Charlotte,' 'Askania,' and 'Baronesse de Rothschild' are probably slight but appreciable advances on 'California.'

Of the old type of single Violets the best examples are 'Wellsiana,' 'Victoria Regina,' and 'Admiral Avellan.'

Other interesting single Violets are 'Sulphurea,' 'Argentiflora,' 'John Raddenbury,' and 'Semperflorens,' which is about identical with the French 'Quatre Saisons.'

Doubles.

A few years ago it would have been impossible to deny the place of honour to 'Marie Louise.' But 'Queen Mary' and 'La Belle Paris' are distinctly better. The former is finer, and the latter freer in blossom.

'Lady Hume Campbell' is still the best of its class. 'Neapolitan' and 'Mrs. J. J. Kettle' are similar. Both are extremely delicate in colour, and of delightful fragrance.

'Comte de Brazza' is the best double white.

Other interesting doubles are 'Mrs. J. J. Astor,' with a remarkable colour and penetrating perfume; 'Madame Bertha Barron' with symmetrical black-violet blossoms; and 'Belle de Chatenay,' which gives fragrant flowers like double white Primroses.

I have spoken about Violets blooming at a season of the year when flowers are scarce. But as a matter of fact, with a little management, you may have Violets in flower for ten months. I bought seventy rooted cuttings of 'Semperflorens' at 1*s*. each some years ago. I bought them in the spring, and grew them on well. By July they had made good clumps and were smothered with blossoms. I was very proud of them, and I well remember a florist who saw them offering me 5*s*. a clump. He said that some people expected Violets all the year round, and he wanted them for wreaths and crosses, as he had never been able to get Violet blooms in July.

'Wellsiana' will follow in August, 'Victoria Regina' in September, and then there is an abundance until Christmas.

'Noelie' is a real Christmas-flowering Violet, a first-class variety, sweet scented, very prolific, and of fair size. 'Lady Hume Campbell' and 'Belle de Chatenay' will flower on well into May, if grown in a cool position.

DISEASES.

I must say a word or two about the chief diseases which attack Violets. The most fatal of all seems to be the fungus disease commonly called "spot," scientifically called *Alternaria violae*. In Volume XXVI., Parts II. and III., of the JOURNAL of the R.H.S., there are three papers on this disease, which deal with it far more trenchantly than I can hope to do. And yet Mr. DORSETT declares "that at present no effective remedy for this disease has been found when it has gained a foothold. The usual spraying with fungicides has produced little

or no effect. The only suggestions made are in favour of prevention rather than cure, by giving careful attention to the production of vigorous healthy plants, in preference to any attempt to check the trouble after it has once gained a hold. Endeavour to secure plants of ideal development. Grow the plants under conditions necessary for producing vigorous healthy growth and protected from conditions likely to induce disease. Keep the houses or frames clean, sweet, and devoid of all rubbish likely to harbour vermin or disease. Propagate only from healthy vigorous stock at the most favourable season. Select each spring none but perfectly healthy vigorous plants from the rooted cuttings for planting in the houses and frames. Old plants are sometimes carried over, but they are not so reliable as the young plants, and much more liable to all kinds of disease. Keep the plants clear of yellow, dead, or dying leaves, being careful to destroy them after removing them from the plants. Keep the plants free from insects and other animal pests. . . . Set the young plants early in the spring in the beds where they are to remain for the season, so that they may get well established before the hot dry weather of summer makes its appearance."

I am convinced that this "spot" almost invariably appears on leaves which have already been damaged by red-spider.

Other diseases are stem-rot and wart disease. I do not know what causes them, and I have seldom seen them. I only suggest, as Mr. Dorsett suggests, that healthy clean conditions, and getting things done at the proper time, is the likeliest method of obtaining immunity from these diseases. And if the plants are badly affected, burn them and get a fresh stock.

And now with regard to red-spider. Mr. B. T. Galloway, in his little book on Violet culture, rightly says that this is one of the worst enemies with which Violet growers have to deal. It is present at all seasons of the year, and ready at all times to begin its destructive work. Such varieties as 'La France' and 'Princess of Wales' are particularly subject to red-spider. 'California' and 'Luxonne' resist it much more effectively. 'White Czar' is seldom touched. The same is true of 'Noelie.'

In doubles 'Marie Louise' suffers worst. 'Lady Hume Campbell' keeps very clean.

Of red-spider it may be said emphatically that prevention is a thousand times better than cure. There are many effective cures for red-spider, but nine out of ten of them will also effectively destroy the Violets. You can get leaflet No. 41 issued by the Board of Agriculture and Fisheries. This leaflet will give you a scientific description of the whole family, a page and a half about its life-history, and a number of methods of control.

I fear, however, that most growers will have to confess that we have not yet solved the problem of the red-spider.

INCREASING THE HOME FRUIT SUPPLY.

By EDWARD A. BUNYARD, F.L.S.

[Read April 11, 1917; Mr. J. HUDSON, V.M.H., in the Chair.]

AT a time when we are scrutinizing very carefully our home supplies it may be of value to include in this survey the average garden, and to see where and how we may best increase its usefulness in the production of fruit. It is, I think, quite possible to augment very materially our fruit supply from this source alone, and my remarks will be addressed to those who grow or wish to grow fruit for their own consumption. In the average garden which we are considering, the fact that first strikes a fruit enthusiast is the absence of any considered plan to extend the season of fruit as long as possible.

The herbaceous border has had long hours of careful thought devoted to it, so that it may present an ordered succession of bloom throughout a long season, and in most gardens undergoes an unceasing revision. In the fruit garden it is seldom that much trouble is expended on this particular matter.

A vast crop of 'Jargonelle' Pears, far beyond the home needs, is often found, and, after 'Williams' are over, a pearless season is experienced until 'Doyenné du Comice' comes to cheer November days. This superabundance of the earlier fruits is a very common feature of the average garden. A standard Apple or Pear which produces several hundred fruits which will only keep for a fortnight is an obvious mistake for a small household. Such varieties would be better grown as pyramids, and for the large trees mid-season and late fruits chosen. Where, however, such large standard trees exist, or even a large wall tree, the balance can be redressed by regrafting most of the branches. The amateur is too apt to think that a large tree is a *fait accompli* which must be borne with, but a visit to Kentish orchards would show him the fruit farmers often regraft their trees many times till they find the variety which "does" best. Large branches nine inches in diameter of Apple and Pear trees can be quite successfully grafted if the wood is healthy. A few hours' study of a nurseryman's catalogue will suggest how gaps can be filled up and the season extended at either end, and so much has been published on this subject that it is hardly necessary to give lists here.

A few fruits deserve a wider cultivation for their utility in extending the season. Such are Autumnal Raspberries which with varieties such as the 'Alexandra' and 'Hailsham' carry the Raspberry season through till mid-October. These autumn varieties should have the canes well spaced out. The Alpine Strawberries too are invaluable

in filling the gaps between the ordinary varieties and earliest plums. Seed planted in August will come up at once, and the plants should be wintered in a cool house or frame and planted out in mid-April. They will fruit abundantly in July and August. The discovery of the better-flavoured Gooseberries is proceeding apace, and for the children home for the summer holidays they are most opportune. Here, too, the season may be extended by planting some of the late-ripening varieties, such as 'Sandwich Yellow,' 'Lancer,' 'Telegraph,' &c. If there still exists anyone to whom the Gooseberry remains a plebeian fruit, to be honoured once at Whitsuntide and then forgotten, they should try 'Cheshire Lass,' 'Langley Gage,' 'Rosebery,' 'Glenton Green,' and repent at leisure. Too little care is given to gathering fruit, and especially does this apply to the earlier varieties. Both Apples and Pears of early varieties require to be gathered when they are still firmly attached to the tree. 'Williams' and 'Jargonelle' pears, for instance, should be gathered when they present a green and formidable appearance. The golden rule is: Gather early fruit early, and leave the late ones on the trees as long as possible. Mid-season varieties require a midway method. Furthermore, early fruits should not all be gathered at once or they all ripen together. If three or four gatherings are made, even if only at a few days' interval, they will ripen successively. One often hears: "All my pears go soft at the core." This is their protest against a late gathering. A few experiments will soon show how remarkable a difference this successional gathering will make. Thinning fruit is also too little practised, resulting in a prolific crop of marbles one year and nothing the next. It might almost be said that no one as yet has ever thinned too heavily. A slight exercise of the imagination will show that one full-sized fruit left on each spur will be quite sufficient in the case of Apples and Pears. Trees which bear only in alternate years can often be brought back to an annual crop by careful thinning. It is frequently said: "We cannot grow fruit, as we have no place to store it." The reply to this is: "It is not necessary." I know no better way of storing Apples and Pears than to wrap them in paper, put in a box and shut the lid. The box is then placed in a cupboard or shed, marking outside the name of the variety and season it should be ripe. 'Cox's Orange Pippin' may thus be kept in perfect condition till March *if well ripened*. A frost-proof building is not necessary. They may be frozen as hard as stones, as mine were this year, but if allowed to thaw slowly, and I fancy in the dark, they will come out uninjured. Anyone who can provide a box, and a place to store it, should be able to keep late Apples and Pears, without the slightest difficulty. I have tried covering Apples in boxes with sand, sawdust, &c., and all are good from the point of preservation, but they all leave some slight flavour. If an odourless medium could be found, this would be an ideal method for the small grower. A frequent cause of fruit keeping badly is the fact that it is not properly ripened. It may be said that every fruit must receive the kiss of the sun once a day. The soft, green fruits growing in the shade are useless, and the pruner should

bear this in mind during his labours. Every branch must have air and light around it. The fine and well-developed fruits on Espaliers and Cordons are a witness to this fact. It is not often realized that cooking Plums may be stored for some time when gathered unripe, and they will ripen more slowly than on the tree. The gages too can be kept for months in a cool room if sound well-ripened fruits are selected. The skins will be a trifle tough, but the flavour even improved. These two must not be allowed to hang too long or they will become flavourless. A point in the pruning of raspberries may be mentioned here. It is usual in many English gardens for the canes to be tipped off at the same height. If, however, the canes in spring are cut at various heights from four feet to two feet from the ground, the shorter canes will fruit much later and thus prolong the season.

HAND FERTILIZING FRUITS.

The question of the self-sterility of certain varieties of fruits is yet in the experimental stage, and I am inclined to think much of the evidence so far offered is somewhat unconvincing. It will be well, however, to take every precaution to ensure a crop, and therefore the carrying of pollen (by means of a rabbit's tail on a slender stick) from one variety to another is advisable where fruit does not set freely. A dry day should be chosen and the pollen lightly dusted on the flowers on two or three occasions. Failing a rabbit's tail a wad of cotton wool or a powder puff will answer equally well.

MANURING.

The question of rational manuring of fruit-trees is, I fear, one that is yet neglected in many gardens. It has been said that the persistent starvation of the lawn is a striking feature of the English gardens, but fruit trees stand scarcely second in this respect. The visible response of plants to nitrogenous manures has often led to the neglect of other equally necessary plant foods. First in importance must be placed lime. All fruit-trees require lime, and without it a large amount of other manure is wasted or rendered unavailable. Lime should be applied, when slaked and in the form of a fine powder, at the rate of 21 lb. to the square yard or 3½ tons to the acre. during the winter months. Chalk is equally good, and the gas lime and the waste from acetylene plants can also be utilized with perfect safety, after exposure to the air for a month or two. Nitrogenous manures should be used if the trees are not growing well, but sparingly in any case.

Next in importance comes phosphate, upon which fertility and earliness depend. This should be applied yearly in some form or other. Superphosphate is the most available, and 1 lb. to each 5 square yards or 8 cwt. to the acre will be a sufficient amount, and it is applied in the early spring months. Basic slag, when it can be obtained, is a valuable source of phosphate; apply 6 oz. to the square yard or 5 cwt. to the acre.

On potash depend the production of sugar and the delicate flavours and scents which make so large a part of the attractiveness of our fruits. It is seldom absent in ordinary garden soils, and the lime-dressing should liberate it in sufficient quantities as a rule. Kainit is of course the usual source, but in these days gardeners have to rely largely upon wood ashes.

The manures mentioned above are mostly things which require to be purchased, but there are many domestic waste products which, usually thrown away or burnt, may be used with great advantage in the fruit garden. All bones, after soup has been made of them, are a valuable, if slow, source of phosphate and should be saved and dug into the soil around the larger trees. Any fur or wool waste (old wool rugs beyond hope), rabbit fur, or wool scraps, soot and feathers will all be valuable in the soil and can be dug in during the winter. Ashes from wood fires should be carefully saved in the dry and spread around the trees in winter. Carbide waste from acetylene plants as mentioned above provides a source of lime and disposes of a disagreeable residue.

It is not often realized how much the soils of the garden may be improved by a few years' careful attention. The action of lime in improving the mechanical state of a sticky clay is well known; the addition of leaf-mould or peat to a dry hot soil will aid immensely in the development of those late fruits which so often suffer from drought in autumn, and are thus hard and gritty or badly shrivelled when the time comes to eat them. While on this subject it may be well to call attention to the danger of neglecting fruit trees after the crop is gathered. Often they are left to struggle through an autumn drought without so much as a thought. The manures as mentioned above will be a great aid, and careful attention to water supply will make them more likely to fruit next year.

Apples, especially those of the Reinette class—'Blenheim Orange,' 'Claygate Pearmain'—and the like, benefit enormously by an annual mulch of leaf-manure, and the later Pears are not less grateful. So far we have considered mainly what may be done with our existing trees; there remains the very important question as to how we may extend the cultivation of fruit-trees in gardens. In visiting the suburbs the fruit advocate is struck by the habit of planting forest-trees in small gardens. A fine Beech or Lime will often take up a very large part of the garden, and render the soil around very unsuitable for other plants. The Bitter Almond too, without which a London garden can scarcely exist, is a thing of beauty and a joy for a fortnight, but an Apple or Pear in its place would be hardly less beautiful and extend its joy into the autumn or winter. Many barren shrubberies might be made more valuable by the addition of a few fruit-trees—Cherries, Plums, Pears, Crab Apples, &c. In park-planting groups of fruit-trees would well replace the forest-trees which custom has stereotyped. Beauty and shade would always attend them, and if, now and again, fruit was also present it would be all to the good. In view of the great destruction of Walnut-trees in France and

Switzerland for gun stocks, this tree should be more widely planted as a shade tree.

In soils which are not considered suitable for fruit-trees much may be done by amelioration as mentioned above, and it would be well if the *obiter dicta* of local authorities were quietly checked by a few experiments. For instance, it is said that the Cherry-tree thrives only on a lime soil, and of course this is very largely true, but no one who has seen the extraordinary Cherry orchards at Werder, where the trees grow on the driest of sandy soils, would feel too confident in ruling out some further experiments. The subject of lime-loving plants is an interesting problem, and is evidently far from being settled yet.

Experiments might also well be made in those colder parts of the country where fruits do not usually thrive, by planting some of the hardier varieties. The Russian Apples and their descendants stand a remarkable degree of cold in Canada and the United States, and such varieties as 'Duchess of Oldenburgh,' 'Emperor Alexander,' 'Wealthy,' 'McIntosh Red' would be likely sorts to do in far northern regions or for high altitudes. In the Pears, Swiss and French experience shows that 'Beurré d'Amanlis,' 'Louise Bonne,' 'Beurré Clairgeau,' 'Catillac,' 'Williams' Bon Chrétien,' and 'Beurré Hardy' all do well at 3000 feet up in the Alps. In districts where late frosts are prevalent, fruits which bloom late may be a help, and such Apples as 'Royal Jubilee,' 'Court Pendu Plat,' and Cherries as 'Napoleon' and 'St. Margaret's' and Plums as 'Belle de Septembre,' 'Bush' and 'Gisborne's' and 'Belle de Louvain' would be worth trying. On dry soils 'White Transparent' succeeds admirably, as do 'Newton Wonder' and 'James Grieve.' On chalk formations 'Newton Wonder' is by far the most successful, but 'Charles Ross' and 'Cox's Orange' may often be seen very happy in such conditions, and are at least worthy of trial. On dry stony banks Cob Nuts and Filberts thrive when little else will grow, and as a valuable addition to our food-supply deserve more attention than they have hitherto received. In partial shade Black and Red Currants, Gooseberries, and Raspberries can be grown, and nuts also do well under other fruit-trees. Finally, I would appeal to those who have land at their disposal, in districts where fruit is not generally grown, to set apart a small plot for experimental purposes. The further development of fruit cultivation on commercial lines will rest very largely in finding new areas closer to the great consuming centres. Landowners can do a work of very great service to their country by starting small experimental plots in which the best varieties for the district may be found by trial, and thus save many years for those who follow them. An immense amount of time and money have been wasted in trying such experiments on the large scale, and if but a little of that amateur enthusiasm which is now so prevalent in the flower garden can be allowed to flow over into the fruit garden, nothing will, I think, be lost in interest and much gained for the permanent benefit of the country.

SNOWDROPS.

By E. A. Bowles, M.A., F.E.S., F.L.S., V.M.H.

[Read May 22, 1917; Mr. F. J. Hanbury in the Chair.]

People often speak of "the Snowdrop" as though they thought there was but one kind, and even good gardeners frequently fail to notice the points of difference between the numerous varieties of these plants. The object of this lecture is to draw attention to the range of interest and beauty possessed by the Snowdrop family for those who care to look closely into a flower. Of late years too many have come to regard flowers merely as producers of colour effects both in the garden and when gathered to decorate their rooms, and the individuality and charm of variations in form and marking have been much neglected.

It is true that where it is possible to naturalize Snowdrops in great drifts in woodland or other wild ground, no variety is better for the purpose than the Common Snowdrop, that is to say, the single form of *Galanthus nivalis* that has spread so freely in some parts of Great Britain as to be reckoned one of our wild flowers, though it was probably introduced by the Romans. On the other hand, quite a small garden can contain a collection of varieties that should produce a succession of blossoms from October till April, and will provide plentiful interest for those who like to compare the variations of distinct forms.

Before looking at the various species and forms, it is worth while noting some of the more interesting structural peculiarities of Snowdrops.

The Snowdrop is a member of the Natural Order Amaryllidaceae, that is to say, that group of Lily-shaped flowers in which the ovary, or seed-vessel, is below or outside the floral segments, and not above or inside them, as in the Liliaceae; while its six stamens distinguish it at once from the Iridaceae, in which Order there are only three.

The flower is pendent. Its position is reversed at the moment it bursts as a bud from between the two spathes united by thin membranes to form its protecting cover when first it is pushed above ground. It is not entirely due to the weight of the flower that it hangs thus. The flower-stalk lengthens while the bud is still enclosed between the spathes, and takes a sharp curve just below the ovary, sufficient to place the flower at about the same angle as that of most daffodils and many other members of this order, such as *Hippeastrum*, *Amaryllis*, and *Crinum*. The slender flower-stalk and the weight of the flower complete the work and produce the hanging bell. This is an ideal form for a flower opening so early in the year in such change-

able and rough weather, and provides excellent protection from wet for the pollen. The anthers do not dehisce—that is, split open—to discharge the pollen, but are formed like sacks, with a small opening at the mouth, and each one has a slender and outward-curved appendage. If touched by an insect visitor the anthers would be shaken and the pollen scattered through the open end. The pollen is remarkably light and dusty for a bulbous plant, and may even be carried by the wind on dry days; but the design of hanging anthers with openings only at the lower end, and trigger-like appendages, points so clearly to preparation for insect agency in the dispersal of pollen that we may conclude the flowers are mostly fertilized by bees. These cling to the inner segments and insert their heads and thorax in search of honey, and are freely dusted with pollen while so doing, when the Snowdrop flower is fresh and expanded. It is easy to shake the anthers by touching the triggers with a pencil point and to see a cloud of pollen fall out.

Thus the pollination of the Snowdrop greatly resembles that of the widely different family of Heaths, in which we also find bell-shaped flowers with hanging anthers opening by pores and armed with triggers.

A very interesting problem is offered by the shape and colouring of the inner segments. As all know, they are generally shorter by one-third than the three outer ones, with a two-lobed instead of a pointed tip (apex), or, to express it in another way, they seem to have a piece cut out of the centre to form a notch (sinus). On their outer surface there is generally a patch of green colouring following the outline of this notch, but which is in some forms reduced to two separate spots on the lobes only. We can find a clue to the evolution of this very peculiar formation by comparing Snowdrops with their near relations the Snowflakes. In these the six segments of the flower are equal in size and similar in shape. Each ends in a distinct lobe or claw with a green spot just above the narrowing and folding that form that claw. If we imagine a further growth of the three outer segments and the elimination of this little terminal fold, we should get exactly the form of a Snowdrop's outer segment.

The green spot has disappeared, either from the expansion of tissues to form the extra size, or, as I think more likely, because it is no longer useful to the flower in guiding insects to the honey—in fact, it would be misleading in a widely expanded flower. On the other hand, the green marking is in all wild Snowdrops of normal construction intensified and specialized in the inner segments, and just round the most convenient place—that is, the sinus or notch—for the insect to insert its tongue.

The arrest of growth of the central claw of the inner segments, and the elongation of the sides into the two lobes, explain their shape, and such a development is just that required to extend the rounded green spot of a *Leucoium* into the horseshoe-shaped mark of a *Galanthus*.

The inner surfaces of these segments are usually marked with green lines on raised ridges between the veins. The honey is exuded from the base of these segments and flows a little way down between the ridges, so that the green lines and the ridges guide an insect visitor's tongue to the honey.

The large Snowdrop, *G. Elwesii*, from Asia Minor, appears to reach the high-water mark of specialization from the Leucoium type of flower. In it we find:

1. Larger and more boat-shaped outer segments.

2. Inner segments that overlap more, and are stiffer and more deeply furrowed, forming a closer bell, more like the tube of a Hyacinth flower in effect, and thus a still better protection for pollen than the more spreading, flatter segments of *G. nivalis.*

3. The triggers of the sprinkling apparatus of the anthers more curved and larger.

4. The presence of an additional green spot at the base of the inner segments. This may help to darken the cavity of the bell, but is so often joined by a central streak to the horseshoe marking that it may serve to guide insects down to the sinus.

Species and Varieties.

Galanthus nivalis. Figure 1 shows a fine tall form of the Common Snowdrop, with particularly well-shaped flowers, and twice as large in all its parts as the ordinary form. It was found in the garden of an old farm in Holland and introduced into English gardens in 1914 by the Haarlem firm of Van Tubergen under the name of *G. nivalis maximus.*

G. nivalis Melvillei (fig. 2) is a very beautiful seedling raised by Mr. Melville many years ago at Dunrobin Castle. I find it rather a dwarf form, but it is said to be taller than ordinary *nivalis* as it grows at Dunrobin. This drawing was made from specimens kindly sent me by Mr. Melville in 1906, and it has never grown any taller here. The globular form of the blossoms and their very slight green markings make it a very beautiful variety.

G. nivalis var. *poculiformis* is another of Mr. Melville's Dunrobin forms, but one which appears now and then among ordinary Snowdrops. The inner segments are similar to the outer in form and colour, and when fully expanded and just showing a gleam of the golden anthers among the pure white segments it has a very distinct effect. Unfortunately it is not a very stable form, and varies much in certain seasons, with inner segments of different lengths and more or less marked with green.

'Magnet' (fig. 4) is one of the late Mr. James Allen's beautiful seedlings. It is said to have been raised from seed of *Melvillei*, but is a much taller form, and chiefly remarkable for the very long and slender flower-stalk, which is so slender that the expanded blossoms sway to and fro in a breeze.

The tall and early-flowering form of the Snowdrop from Southern Italy is known as *G. Imperati*. The flowers figured (fig. 5) were grown in Canon ELLACOMBE's wonderful garden at Bitton, where the long line of this fine variety under the south wall was always a beautiful sight in January.

There are several forms of *Imperati* in cultivation, but this one, which I believe was distributed originally by ATKINS of Painswick, and is called var. *Atkinsii*, is the finest of them. Tall, with a beautifully long bud and a large spot of light green and one of the earliest to flower, it is a very precious plant. A somewhat similar form was distributed by BACKHOUSE of York some years ago, but differs in a tiresome habit of seldom producing a perfectly formed flower. Either they have an extra segment, or one of the inner ones is longer than the others, or, again, a petaloid white bract may appear just below the ovary.

The large size of the green markings, and the slightly rolled edges of the young leaves, suggest that these large *Imperati* forms are of hybrid origin, and that *plicatus*, the Crimean Snowdrop, is one of their parents.

The Straffan Snowdrop, *G. caucasicus grandis*, is to my taste the most beautiful of all forms. The flowers are rounder and shorter, and, I think, better proportioned than in *Imperati*.

The drawing (fig. 6) was made from flowers sent to me for the purpose by Mr. BEDFORD, for many years the head gardener at Straffan, in County Kildare. There is a mystery as to the origin of this fine form. Mr. BEDFORD has lately said he believes it to be a seedling form. The late Mr. BURBIDGE greatly admired the plant as grown at Straffan, and considered it a form of *caucasicus*, brought by Lord CLARINA in 1856 from the valley of Tchernaya in the Crimea, among bulbs of *G. plicatus*. Anyway, Mr. BEDFORD was the first to notice it in 1858, when two flowers superior to their neighbours caught his eye.

All those now in existence were raised from that one bulb, and though it increases well by offsets it does not perfect seed. Notice the way in which each bulb, when strong, produces a second flower between the pair of leaves. This is very characteristic of the Crimean Snowdrops, and most of the seedling forms with *caucasicus* or *plicatus* in their parentage inherit this pleasing habit. Another virtue of this plant is that it comes into flower rather late, and when *Imperati* is over.

'Allen's Seedling' (fig. 7) is a particularly graceful form, considering the great size of the flower. It reminds one of 'Magnet' in the length of the flower-stalk; but the size of the green markings and slightly rolled edges of the leaves point to *plicatus* as one parent and *Melvillei* might be the other, from which the width of the outer segments has been derived. Such a beautiful plant as this should encourage others to raise seedlings from the best types available.

G. nivalis 'Galatea' (fig. 8) is another of Mr. ALLEN's seedlings. In his paper on 'Snowdrops,' read at the Snowdrop Conference held by the R.H.S. (see JOURNAL R.H.S., vol. xiii. p. 174), he wrote:

"This too is one of the giants of the family as to size of flower

but not in stature. I have never been able to decide whether this or 'Charmer' is the more perfect flower."

Unfortunately 'Charmer' seems to have been lost, and I have never been able to hear of it, and a rival to 'Galatea' would indeed be worth finding. This is the largest-flowered of the race of seedlings that are best classed as *nivalis* forms, and the flowers are of such good substance that they last in beauty longer than those of most forms. A strong bulb gives a second flower from its pair of leaves, and that and a slightly rolled edge to the leaf show the influence of *plicatus* somewhere in its pedigree.

Several forms of the Common Snowdrop have been found in Greece which flower in the autumn instead of the New Year, and send up their flowers before the leaves, or at any rate while they are only just appearing above ground. When the leaves of these five varieties are fully grown they are all noticeable for the pronounced contrast of a glaucous central stripe with the deep green of their sides. They are best regarded as forms of *nivalis*, and vary very slightly from one another, but retain certain characters of time of flowering and size of the green markings. That known as *Olgae* is generally the earliest to flower, coming up as soon as the late September rains moisten the ground. It was found by the botanist ORPHANIDES on Mount Taÿgetus. The green is very pale in an old blossom, and fades out entirely if such a one be dried. This has resulted in its being described as without green markings.

The form known as *Rachelae* is the handsomest and most robust of these autumnal forms. It flowers in mid-October. When Professor MAHAFFY, of Trinity College, Dublin, was in Greece, he collected a few bulbs at random to send to his friend Mr. BURBIDGE. Among them was a solitary bulb of this Snowdrop collected in 1884 on Mount Hymettus. The few that now exist in our gardens are all descendants of this one bulb. It and another variety known as *G. Elsae*, found on Mount Athos, were named after Professor MAHAFFY's two daughters.

Green Snowdrops are perhaps more interesting than beautiful. They seem to be reversions to ancestral forms with Leucoium-like green spots near the tips of the outer segments, and forms with tendencies to these green markings have been found in all four of the distinct races of Snowdrops.

The earliest found and best known of them is a form of *nivalis* called *Scharlokii*. It was found by Herr JULIUS SCHARLOK in 1868 in the valley of the Nahe, a tributary of the Rhine. In figure 9 you will notice that, besides the extra green markings, it is very remarkable in having the two leaves that form the spathe free and distinct instead of joined together by membrane as in other Snowdrops. This also may be an ancestral form, and is not very constant, as in some seasons many flowers appear with the spathes united for half or more of their length.

A somewhat similar variety appeared among the large form sent

FIG. 1.—GALANTHUS NIVALIS MAXIMUS.
2/5 nat. size.

[To face p. 32.

Fig. 2.—Galanthus nivalis Melvillei.
2/3 nat. size.

FIG. 3.—GALANTHUS NIVALIS POCULIFORMIS.
Nat. size.

FIG. 4.—GALANTHUS NIVALIS MELVILLEI 'MAGNET.'
1/2 nat. size.

FIG. 5.—GALANTHUS IMPERATI.
2/5 nat. size.

FIG. 6.—GALANTHUS 'STRAFFAN' SEEDLING.
2/5 nat. size.

FIG. 7. GALANTHUS NIVALIS 'ALLEN'S SEEDLING.'
3/5 nat. size.

FIG. 8.—GALANTHUS NIVALIS 'GALATEA.'
1/2 nat. size.

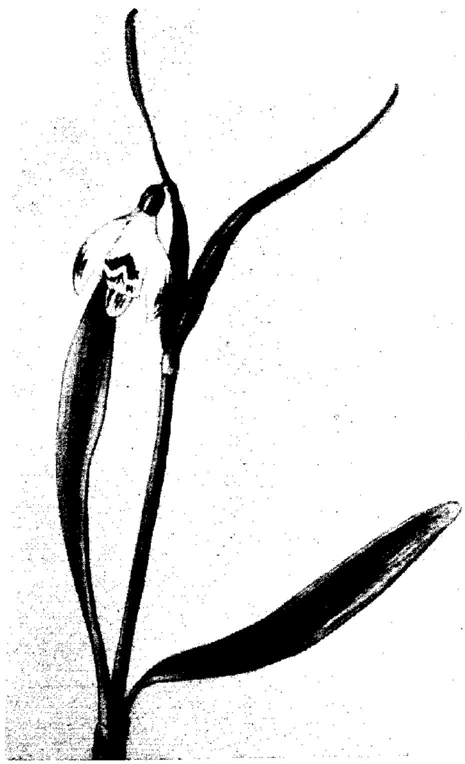

FIG. 9.—GALANTHUS NIVALIS SCHARLOKII.
2/3 nat. size.

FIG. 10.—GALANTHUS PLICATUS MAXIMUS.
1/2 nat. size.

FIG. 11.—GALANTHUS LATIFOLIUS.
1/2 nat. size.

FIG. 12.—GALANTHUS ALLENII.
2/5 nat. size.

FIG. 13.—GALANTHUS FOSTERI.
1/2 nat. size.

Fig. 14.—Galanthus Elwesii, Green-spotted Forms.
1/2 nat. size.

FIG. 15.—GALANTHUS ELWESII, UNSPOTTED FORMS.
2/5 nat. size.

FIG. 16.—GALANTHUS BYZANTINUS.
1/2 nat. size.

[*To face p.* 33.

out by Mr. VAN TUBERGEN, and this too has curious spathes, larger and less united than in the white form.

A very curious plant, in which the inner segments are all green except for a narrow white edge, and the outer ones striped for the greater part of their length with a greyish-green, was introduced through Herr MAX LEICHTLIN, of Baden, and has been traced to the Vienna Botanic Gardens, but no farther. It is a dwarf, late-flowering form, known as *G. caucasicus virescens*, but has no resemblance to other forms of *caucasicus*, and never, so far as I have seen, produces a second flower in the pair of leaves as a *caucasicus* form should.

There is also a very curious double flower that does not droop, and has all its alternating rows of inner and outer segments deeply tinged with green. It appeared suddenly in a Scotch garden where no other Snowdrops than the ordinary *nivalis* had been grown.

Yellow Snowdrops do not perhaps sound beautiful, but when seen in the sunshine of a fine February morning a clump of either of the yellow forms is very striking. In the var. *lutescens* the ovary and the ordinarily green markings are of a bright yellow. Two distinct forms with these golden markings have been found in Northumberland, and have travelled thence into many good gardens.

Last year Mr. CLARENCE ELLIOTT sent me a flower of a form new to me, in which the segments themselves are tinged and striped with yellow. It was rather a faded and crumpled flower, but a fresh one might well be an attractive addition to the yellow forms.

In a Cheshire garden there appeared a form of double Snowdrop with a green ovary but the markings of the inner segments bright yellow. This is a very charming flower, and though in the first season, after they have been replanted, some will have green markings, it is fairly constant when undisturbed and has a very bright effect when fully open.

The last *nivalis* form needing mention is a double one raised by Mr. ALLEN, and called by him 'Charmer' *flore pleno*. It differs from the ordinary double in having only three of its handsome, large outer segments, and the centre filled up with whorls of the green-striped inner segments only, thus producing a very neat and regular flower, like a double Ranunculus.

Thus far we have been concerned with forms that are best grouped under *G. nivalis*, the Common Snowdrop. Now we pass to the second group, *G. plicatus*—so named because its leaves are plicate, that is to say, folded back or pleated at their edges, at their first appearance above ground. The leaf characters offer the most useful means of dividing the known Snowdrops into four groups.

Thus we have the *nivalis* group, with narrow almost flat leaves, more or less glaucous, that is, blue-grey, on their upper face.

Then *plicatus*, with broad deep green-leaves folded at their edges. *G. plicatus* is found in the Crimea and Dobrudscha, and is generally called the Crimean Snowdrop. When the snow melted away from the trenches in which our soldiers passed the bitter winter of the Crimean

War, great numbers of this Snowdrop flowered and whitened them again; and several forms of it came to our gardens straight from those trenches.

Like *nivalis* it varies a great deal. The form called *G. plicatus maximus* (fig. 10) is perhaps the finest of all, but will not grow happily in every garden.

It has a yellow variety, which has been grown for many years in the Cambridge Botanic Garden, and came to me from thence; and there is also one which in some seasons has green markings on the outer segments and in which the inner segments are almost entirely green, and this year a double form has appeared in an Irish garden.

The third group is distinguished by its leaves being wide, without folds, and of a peculiarly shining bright green, and generally arching outwards in graceful curves.

The Caucasian species, *G. latifolius*, was the first known of this group, and the others seem to be only geographical forms of it, or possibly hybrids.

G. latifolius itself is shown in fig. 11, and it will be seen that its flowers are rather small and colourless, and do not come up to the promise of its handsome leaves..

In 1883 Mr. ALLEN received some bulbs of *latifolius* from an Austrian nurseryman, Herr GUSMUS, and among them was one altogether superior to the rest. This has since been named *G. Allenii*, in honour of its introducer. Fig. 12 shows what a well-grown specimen of it can do when it has arrived at its full growth. Fortunately this treasure has a good constitution, and has passed from Mr. ALLEN'S garden at Shepton Mallet into many others.

Several intermediate forms are in cultivation between the typical *latifolius* and the best form of *Allenii*. A seedling form I noticed at Bitton, and was allowed to carry away with me, is probably a hybrid between *Ikariae* and *Imperati*, and is most like the former, but differs in having rather longer and narrower leaves and in flowering a fortnight before it.

The true *Ikariae* is only found on the Island of Nikaria, off the coast of Asia Minor. It is one of the latest of all to flower, and the large flowers are very richly marked with green, and its leaves bend outwards more than in any other form.

Fig. 13 shows *G. Fosteri*, which is thought to be a hybrid between *latifolius* and *Elwesii*, as having the wide shining leaves of the former and the flower of the latter. Also the leaves differ in many specimens from *latifolius* in being deeply concave on their upper surface, which, as we shall see, is one of the features of *G. Elwesii*.

It was introduced by Sir MICHAEL FOSTER from Amasia, in North Central Asia Minor, but has not proved as fine a garden plant as it promised to be. MAX LEICHTLIN called it 'The King of Snowdrops,' and Sir MICHAEL FOSTER praised it highly; but I have never seen a finer specimen of it than the one the figure was drawn from, and I think it a badly proportioned flower, and find it a bad grower.

The fourth group contains *G. Elwesii* and its many varieties. They come from Asia Minor, and are for the most part handsome and large. The leaves are more uniformly glaucous than in other Snowdrops, and are generally very wide and concave on their upper surface, but vary enormously. So also do the flowers, but they almost always show a second large patch of green at the base of the inner segments. This may be joined to the horseshoe-marking by a narrow central line, or in some varieties almost covers up the whole of the inner segment. Some abnormal forms have green spots on the outer segments (fig. 14), and some (fig. 15) are without the second green spot. I have seen only two in which it is missing, though I have heard of another in Mr. BOYD's garden.

Many people complain of the difficulty they find in growing *G. Elwesii*, and that it dies out after a year or two. In other gardens it increases fairly well from offsets, and rapidly from self-sown seed. With me it likes a fairly open situation, so that it may get well ripened in summer. It has died out when planted under shrubs, but has seeded and increased well in a rather dry peat-bed planted among dwarf Heaths, and I believe is going to do well in a bed of Ivy under a Deodar, a very hot and dry position. In some steep and well-drained banks of the rock-garden it has also increased well.

It has been very largely collected of late years—before the war, of course—and among collected bulbs, early and late, dwarf and tall, round and long-flowered, and many types of variation can be found.

It hybridizes easily with other species, and the seedlings are as a rule vigorous and handsome. One of Mr. ALLEN's seedlings, called by him 'Robin Hood,' is *Elwesii* × *plicatus*, and though it shows but little of the folded leaf of *plicatus*, yet the characters of both parents may be seen in the foliage and even more clearly in the flowers, which have the large, rounded outer segments of *Elwesii*, while the inner ones have the deep green of *plicatus* and the additional amount of it of *Elwesii*.

Mr. ELWES gave me a very curious Snowdrop he found at Colesborne among groups of *G. Elwesii*. When first the flowers open they are on such short stems that they are hardly lifted above the ground. Later on they grow taller, and strong bulbs throw up a second flower. The leaves spread outwards in a very marked manner, and the ovary is peculiarly long and narrow for any Snowdrop of *Elwesii* relationship. I think it must be a hybrid, and suggest that it has been produced by a cross of *Elwesii* and *caucasicus*.

G. byzantinus (fig. 16) is supposed to be a natural hybrid between *Elwesii* and *plicatus*. It was introduced in 1893, and has since been largely collected near Broussa. It has the wide folded foliage of *plicatus*, but of a lighter and more glaucous green, while the flowers are similar to those of *Elwesii*, and very variable in their markings and shape. It is a beautiful garden plant, as where it does well it is one of the earliest of those that follow the autumnal forms. It generally appears above ground here in November, and bears many

blossoms in December, and is at its best about the first week of January if the weather is mild, but keeps up a succession of flowers till the end of the month. It increases well by offsets and sows itself.

Mrs. R. O. BACKHOUSE, of Sutton Court, Hereford, crossed *nivalis* with *plicatus* and obtained a very beautiful strain of large-flowered forms, which Mr. BAKER has named *grandiflorus*. Unfortunately they are not long-lived, and die out after a year or two, or they would be among the finest of Snowdrops.

We have seen a few of the many varieties of this favourite flower, which will give you some idea of what has been done by collectors and seed-raisers. I feel sure much more might yet be done to add other forms to our gardens. It is quite likely that many autumnal or winter-flowering forms could be found in Greece, and that, if we all saved and sowed at once the seed produced in our gardens, greater vigour and perhaps still greater beauty might be found among the seedlings.

CULTIVATION.

The main point to insist upon in growing Snowdrops is to keep them out of the ground for as short a time as possible.

If transplanting them in one's own garden, the best time is when they are in full flower, provided that in digging them up none of the roots are broken, that they are not allowed to get at all dried before replanting, and that the roots are spread out in as natural a position as possible in their new situation. When buying bulbs they should be ordered early, so that they may be delivered in July or August, and certainly not later than September, and they should be planted as soon as possible after their arrival.

Most kinds like a cool but well-drained soil, and seem happier when growing among the roots of deciduous shrubs, but I have seen *nivalis* very happy in a low-lying bit of ground often flooded in winter; and *Elwesii*, as I have said before, certainly in this garden prefers a warm dry bed, where the sun can warm the bulbs and ripen them.

ATKINS' form of *Imperati* also appreciates warmth, and is never better than at the foot of a south wall, as it grew so finely at Bitton.

DELPHINIUMS.

By AMOS PERRY, F.R.H.S.

[Read June 5, 1917; Mr. W. A. BILNEY, J.P., in the Chair.]

DELPHINIUMS are among the most popular of plants for general border decoration. They are quite hardy, quickly establish themselves in any well-cultivated sunny border, and no garden can be considered complete without a representative collection.

Many species both annual and perennial are well known in cultivation, the most popular being the stately hybrid perennial Larkspur, valuable on account of their variable heights and wonderful range of colours.

The old strains of Delphiniums have been improved almost out of recognition. Compare, for instance, the narrow-petalled flowers, crowded together, which you found in the varieties popular twenty years ago, with a well-developed spike of 'King of Delphiniums.' This has been the work of years of careful selection. Their popularity has given the nurseryman and the amateur sufficient encouragement to experiment in the raising of new and improved forms, and we owe a great debt of gratitude to the houses of KELWAY and V. LEMOINE for their work in this direction. Many of the sterling varieties now common in our gardens came first from Langport and Nancy.

Cultivation.—Although the hybrid perennial Larkspur is of very easy cultivation, the finest results will be obtained only when special attention is given to their requirements. Where the soil is heavy and saturated during the winter months, and parched during the summer, the borders should be deeply dug or trenched during the early autumn, and well-decayed manure incorporated, and allowed to remain fallow during the winter months, planting early the following spring. On the other hand, should the soil be loose or sandy the borders should be deeply dug, arranging for a copious supply of manure to be placed at the bottom of the trench to encourage deep rooting, and planted during early autumn. As a precautionary measure I would recommend a mulching of manure during the summer months and an abundant supply of water during very dry weather, especially in the period prior to flowering.

It is a very common practice to cut Delphiniums down immediately the first flush of beauty is over, when a further display may be looked for during August and September, but then the plant has a tendency to make numerous crowns, and the following season you will have to pay the penalty by having a number of small spikes and not such a good display as might be expected from established

plants. I strongly recommend you, especially those who are wanting spikes for exhibition purposes, to allow the plant to ripen a small portion of its seed. If, however, specimen spikes are not wanted, the plant can be cut down immediately after flowering. It will then be necessary to give a liberal dressing of well-rotted manure and an occasional watering with manure water.

During the winter months Delphiniums are often attacked by slugs, with most disastrous results. As a precautionary measure carefully remove the soil from the crowns and cover with 2 or 3 inches of very fine ashes. This I have always found most effective, and certainly more reliable than the many patent remedies now on the market. I also recommend the plants to be divided and transplanted every third or fourth year.

There are several methods of propagating—divisions, layers, cuttings, and seed. The most popular method of increasing stock is by division; this should be done during March. The practice I annually adopt is to lift my plants towards the end of February or in early March, when the stock is quite dormant, and place in a cold frame. Immediately they have started into growth they are again lifted and divided, cutting away as much of the old root as possible, leaving two or three crowns to each division. They are then laid back in the frame for another three or four weeks, kept close for a week or two, and are then quite ready for planting in their permanent quarters. Care should be taken to select favourable weather for this operation, and, above all, do not let the young stock suffer from drought.

The best time for taking cuttings is during the early spring. Carefully remove the soil from the parent plant and take the young shoots about 3 or 4 inches high, selecting the weak spikes, taking the utmost care that a little of the old plant adheres to the young cutting. Place in a cold frame in sandy loam, keeping closed for a week or ten days, and after that period give air daily. When they are rooted they should be transplanted or potted, ready for planting the following autumn or spring. Cuttings may also be taken during late summer and autumn from plants that have been cut back for a second crop of flowers. Select non-flowering spikes, securing as much as possible of the mother plant; insert in sandy loam in a closed frame. I cannot recommend this method, as I find on my wet and heavy soil losses have been very severe, and I only revert to this unsatisfactory method when I have been unsuccessful with some particular stock during the spring.

I have raised large stocks of many of the finer varieties by layering, and can with every confidence recommend this method of increasing stock. I usually start layering towards the end of May and through June. It is necessary to make a neat cut at the extreme base of the stem, well covering the cut with fibrous loam, carefully securing the stem to a centre stake to hold it upright. Leave the layers on the mother plant until the following spring; in this way I usually secure good stocks of healthy youngsters. Occasionally I have been com-

pelled to move the layers during the early autumn, but always with disappointing results.

Sowing seed is a very simple and interesting method of raising stock. Sown in a cold frame immediately the seed is ripe, the plants will flower well the following summer. Care must be taken of the seedlings during the winter months, and on no account must they be coddled. They should be kept moderately dry, with plenty of air, and on favourable occasions remove the lights and do all that is possible, so as not to encourage early growth. Transplant into their permanent positions early in March, providing the weather is favourable.

Great care should be taken in selecting the varieties for seed, choosing only those of clear, distinct colours, robust habit, and symmetrical well-set spikes.

Quite a number of the distinct types will come remarkably true from seed. *Delphinium* 'Rev. E. Lascelles' is capable of producing a very high percentage of large circular flowers, with its characteristic spreading centre. 'King of Delphiniums' has produced a very encouraging percentage true to type. 'Geneva,' one of the most popular light-blue bedding varieties, has produced in my garden quite 50 per cent. absolutely true to type and colour. Of course the seedlings are a little more vigorous, but after they have had one or two years' propagating it is impossible to distinguish them from true 'Geneva.'

I trust these few remarks will not lead you to assume that the general collection of hybrids can be raised true from seeds.

During the last twenty years I have specialized in this family, and I have records of over 500 named varieties that have been grown in my Winchmore Hill and Enfield gardens for trial purposes. These were secured from reliable sources both at home and abroad, and at least 400 of this collection have been found wanting in some respect.

The majority of the flower-loving public desire in Delphiniums vigorous constitution, clear self colours, and symmetrical well-set spikes. The following twelve varieties are, in my opinion, the finest yet introduced, and in arriving at this judgment I have been somewhat led by an analysis of my order sheets.

Introduced about twenty-five years ago, 'King of Delphiniums' is still one of the most popular. I have for some years past been making large shipments of twelve to fifteen thousand plants of this popular variety for overseas trade.

'Statuaire Rude,' gigantic spikes, immense flowers of a delightful shade of heliotrope blue.

'Table Ronde,' immense circular flowers, delightful shade of reddish plum.

'Henri Moissan,' immense flowers, rich purplish blue.

'Cory,' a Continental variety of great merit, exquisite shade of forget-me-not blue.

'Nellie,' another variety of Continental origin, enormous spikes,

large circular flowers, rich shade of clear sky-blue with bold white centres.

'Duke of Connaught,' immense spikes, rich gentian-blue, bold white centre.

'Queen Mary,' large circular flowers, striking shade of rich azure-blue with conspicuous white centres.

'Rev. E. Lascelles.' This variety has gained great popularity partly on account of its dwarf habit, well-set spikes, large circular flowers, rich blue with a striking white centre.

'La France.' One of the most distinct that has come under my notice, and when established producing branching spikes 2 to 3 feet across, flowers soft lavender and sky-blue.

'Moerheimi,' the first and only pure white variety that has come under my notice. This is a plant of great merit, and when associated with the blue varieties is very effective for bedding and border decoration.

'Bella Donna,' an old and popular favourite, whose origin is veiled in obscurity. For bedding purposes this and its varieties are unique, growing 2½ to 3 feet, and flowering throughout the whole summer. Mr. G. GIBSON of Bedale was the first to raise seedlings from it in his garden during the summer of 1899, and many varieties are now in cultivation superior in colour and constitution. The finest are 'Mrs. Brunton,' 'Mrs. Thompson,' 'Grandiflora,' and 'Mrs. G. Gibson.'

Notwithstanding the great popularity of this interesting family, hybridists have not yet interested themselves, consequently hybrids are practically unknown. During 1914 an interesting series was raised and distributed by V. LEMOINE of Nancy by crossing *Delphinium elatum* and *D. tatsiense*, a Chinese species of recent introduction. These pretty hybrids will command attention when better known. They are remarkably free-flowering, and admirably adapted for bedding and cutting purposes.

Among the species now in cultivation, *D. cardinale* is without a doubt one of the most handsome, revelling in a moist, well-drained sandy soil, and when established growing 6 feet high, with branching stems smothered with brilliant orange-scarlet coloured flowers.

Another charming species is *D. Zalil*, introduced from Afghanistan about 1887, and extensively used in Persia for dyeing silks. I have been most successful with this plant, growing it 5 to 6 feet high in stiff, heavy loam in the driest part of my garden. The whole forms a neat feathery bush smothered with pale-yellow flowers.

D. formosum is extensively grown by our market men for cutting purposes. It has a neat habit and attractive olive-green foliage, with somewhat flat heads of rich purple flowers.

D. cashmirianum, a species of great merit, neat symmetrical bushes covered with soft blue flowers—a very pretty subject for the rockery.

D. nudicaule is a dwarf Californian species growing about 15 inches high, revelling in a sunny position in the rockery or border, neat

twiggy habit, covered with dazzling scarlet flowers. There are several varieties of this pretty species. One of the best known is *aurantiacum* with orange-yellow flowers, and *D. nudicaule purpureum* with flowers of a delightful shade of deep rose-purple. The entire stock of this new variety is in the hands of a Continental nurseryman and not yet distributed.

D. grandiflorum and its varieties are immensely popular, and justly so, and if given a congenial spot and a little attention are objects of the greatest beauty. They are easily grown in any well-drained spot, taking care always that they have a copious supply of water during the very dry weather. They form neat bushes of attractive foliage smothered with large well-formed flowers, pretty shades of gentian-blue, sky-blue, plum, and purest white, both singles and doubles, all growing under 18 inches and most easily raised from seed. If sown in their permanent quarters and carefully thinned out, will flower the first year.

I am working up a large stock of a very remarkable break that occurred in my garden during 1914. This variety when established will grow 3½ to 4 feet high, and branching in a way that reminds one of *Delphinium* 'Persimmon,' but with the characteristic root stock of *Delphinium grandiflorum.*

D. Nuttalli, a handsome North American tuberous-rooted species, well worth cultivating on the rockery or any well-selected spot in the border, growing about 18 inches high, with neat branching spikes of pure white flowers having a conspicuous blue blotch on the upper segment.

D. vestitum is not well known in the garden, but is a distinct and handsome species from the Himalaya. The flowers are somewhat small, but of such a deep purple-blue that, together with their black stems and centres, they make a striking feature towering up amongst the other herbaceous plants. It is also valuable because it flowers later than the florist's varieties.

D. trolliifolium should be grown for the sake of its glossy handsome leaves and rich blue flowers, produced in great profusion at the end of May and before many of the family are in bloom.

D. elatum, from the Alps of Central Europe, is not very showy, as too often the flowers are of a slaty blue.

Many interesting species have been introduced lately from China. Mr. GEORGE FORREST, writing in the *Gardeners' Chronicle* on September 9, 1916, states that the higher Alps of North-Western Yunnan towards the Tibetan frontier are the homes of many beautiful species ranging from 4 inches to 6 feet, and their colour range is very great, from the palest blue to deep rich purple, and in some species white. However, the gems that are most likely to prove of the greatest horticultural value are amongst those of the lesser stature.

One of the most attractive that has come under my notice is *D. likiangense.* This beautiful Alpine species is now well established in the famous Botanic Gardens, Edinburgh, growing 12 inches to 15 inches high, and forming symmetrical tufts of finely divided glossy green

leaves and numerous erect stems, terminating with three to five flowers, of a pleasing shade of soft light blue.

D. Pylzowi is another beautiful species with large deep-blue flowers on slender stems, and so dwarf in habit as to associate with some of the choicest of the rock-garden plants.

Annual Larkspurs.—In these hardy annuals we have a great wealth of beauty and an unusually wide range of colour. They are also very varied in their habits. Their cultivation is simplicity itself. They can be sown any time after February. They can also be sown during September and October, but if autumn sowing is adopted care should be taken to protect the seedlings from slugs &c., and this can easily be achieved by covering the seed patch with fine ashes.

I do not advocate transplanting. I find they do very much better if sown in their permanent quarters and carefully thinned out when the plants are large enough to handle. They are not at all fastidious as to soil or situation. They will thrive in the driest possible position, and charming effects can be cheaply produced by judicious planting of these charming annuals, grouped between shrubs, in the herbaceous borders, or even on the rockery. They are at their best during July and August.

The species that have given rise to these attractive annuals are *D. Ajacis* and *D. consolida.*

The rocket Larkspur, *D. Ajacis*, is the most varied, and has been arranged in three groups. The tall rocket Larkspur, *D. Ajacis major*, has stout well-arranged spikes growing 3 to 4 feet high, bearing myriads of single and double flowers, white, pink, rose, violet, blue and intermediate shades, and is the best variety for general border decoration. The dwarf rocket Larkspur, *D. Ajacis minus*, is particularly neat in appearance, growing 18 to 24 inches high, has well-set spikes of double flowers ranging from white to deep rose, and is admirably adapted for planting in the front rows of the border. The Hyacinth-flowered Larkspur, *D. Ajacis hyacinthiflorum*, is admirably adapted for pot cultivation, has a dwarf sturdy habit pretty tapering spikes of clear-coloured flowers, in general appearance reminding one of a well-grown hyacinth.

D. consolida, the branching Larkspur, is quite distinct from the preceding and equally as valuable from a gardening point of view, seeing that it is later, considerably prolonging the flowering season, with tall branching stems, smothered with medium-sized flowers, in richest shades of violet, purple, white, and pink.

D. consolida imperialis, or 'Emperor' Larkspur, is particularly valuable on account of its dwarf habit, forming neat symmetrical bushes 18 to 20 inches high, $2\frac{1}{2}$ to 3 feet in circumference, covered with full double flowers for a considerable period.

BORDER CARNATIONS.

By J. Douglas, F.R.H.S.

[Read June 19, 1917; Sir J. T. D. Llewelyn, Bart., V.M.H., in the Chair.]

Many people fail to appreciate the capabilities of the true Hardy Border Carnation, because of imperfect knowledge of its cultivation, or on account of confusion of mind resulting from reading articles in praise or dispraise of the Perpetual Flowering Carnation as a border flower.

The two types are very far apart, and I do not propose to make comparisons between them, but simply state that I cannot recommend the Perpetual-Flowering Carnation as a border plant for an amateur grower, though I believe there are some who are able to do so. I leave the comparison to the beginner to ascertain by experience. My own experience is that the ordinary American Tree Carnation cannot stand against our damp cold winters. It is with the Border Carnation proper that I propose to deal in this paper.

It always seems to me that many people give themselves a vast amount of trouble layering Carnations and wintering them in cold frames, when far better results can be obtained by allowing the plants to remain undisturbed for a few years. The Hardy Border Carnation is a true perennial, and should be grown as such. When the object is a display of flowers, then by all means allow the plants to stay in the same place for at least three years, mulching them every summer with horse manure. This treatment keeps the roots cool and moist in dry weather, and at the same time acts as a valuable stimulant. It is a fact, however, that the largest and most suitable blooms for exhibition are obtained from one-year-old layers; but the display they produce is not to be compared with that of the two- or three-year-old plants. I have often seen as many as 400 blooms on one of these three-year-old plants, which frequently measure three feet across. A few years ago it was considered the right thing to layer every plant in the garden, starting the following season with young rooted layers transplanted and arranged, sometimes in nice symmetrical rows, according to a well-thought-out colour scheme carefully planned beforehand. I am not ashamed to say that I learnt wisdom from one of our garden labourers, to whom I had given a few surplus plants to adorn his cottage garden. These were planted in a small patch of ground in the front of his house and left there for five years undisturbed. At the end of three years they had become huge healthy clumps, bearing from 350 to 400 flowers. Another very good way of assuring an abundant supply of bloom is to peg down, or rather layer, the side growths around the old plant, allowing them to bloom and remain undisturbed and

unseparated from the parent plant. This is a very good way indeed, for it prevents the leggy appearance sometimes noticed in the older plants, and always assures a nice compact clump.

Great improvements have been made by hybridization within my own experience, which extends over the last twenty-five years.

In the year 1889 it appeared certain that, if the Border Carnation was to become a garden favourite, easily cultivated and enjoyed by the small amateur as well as by the professional gardener, something must be done to improve its physique, whilst carefully preserving the wonderful form of the flower, which in the past had always distinguished this aristocrat of the Dianthus family.

The worst fault appeared to be the inherent weakness of the stem, causing the flowers to flop over—even in varieties having small blooms—unless they were carefully staked, displaying also what is technically termed a weak neck.

Another fault equal in degree to the last was an almost total absence of scent. 'Raby Castle' and the 'Old Clove' were two of a number that could be counted on the fingers of one hand, having any pretension to a clove scent. Again, the range of colour was limited; 'Mrs. Reynolds Hole' was the only apricot self worthy of the name, and in yellows, 'Germania,' a German variety raised by BENARY of Erfurt, was alone. Both these varieties, most pleasing in colour and of exquisite form, the latter having the appearance of a yellow Gardenia, were more than difficult in the border, and, to be frank, were without a real constitution, both needing careful growing and wintering in a greenhouse or frame.

About this time, however, the late MARTIN R. SMITH of Hayes and my father, the late JAMES DOUGLAS, of Great Bookham, determined to evolve a useful race of Hardy Border Carnations, neither being satisfied with the English varieties available in the year 1889. A complete change of blood seemed to suggest itself as the only solution. Both were enthusiastic florists and men of great determination. They therefore set out together on a tour through Germany, France, and Holland in search of varieties suitable for crossing with the standard English varieties then in cultivation. The nursery of ERNST BENARY of Erfurt provided about two dozen varieties thought to be distinct and favourable for the purpose. And how very German were the names and how bizarre the colour of that little collection!

'Brockhaus'; buff flaked slaty grey.

'Julius Bassermann'; yellow striped scarlet and purple.

'Parsifal'; buff streaked red and orange.

With these two dozen German varieties, and one or two picked up in Holland, the two enthusiasts set to work, and very soon several hundred grand varieties were produced, many of them being standard to-day, such as 'Cecilia' sent out by DOUGLAS in 1899, but raised by MARTIN R. SMITH; 'Liberté,' 'Miss Willmott,' and 'Elizabeth Shiffner' raised by J. DOUGLAS, and the fine old clove-scented 'Lady Hermione' raised by MARTIN R. SMITH. Many Fellows of this

Society will remember the wonderful exhibits of these gentlemen between the years 1899 and 1909. Yet even at this time, a fine-petalled flower was sure to find a place with the chosen few from the seedling bed, without too many questions being asked as to its other qualifications to rank as a Hardy Border Carnation. So that, although the race had been immensely improved in constitution and the highest standard of form established, an ideal border habit was not generally characteristic of them; for, although it is good to produce magnificently formed flowers that can win in strong competition, there is much else essential to the Border Carnation. My own views of what an ideal Border Carnation should be are as follow:

First, and all-important, is the stem that bears the flower. This should be perfectly rigid and capable of bearing the flowers erect without the necessity of using stakes; the bloom itself should possess a sound long calyx not overcrowded with petals, for it must be remembered that the flower will be exposed to rain, and buds crowded with petals often rot ere they can expand, owing to the wet. Of course the calyx should be strong enough to enclose and sustain the petals without bursting.

Secondly, all Border Carnations should be sweetly scented, and if possible, clove-scented. We are making this a great point now, and have already Cloves in every shade except yellow. I have never yet seen a yellow Carnation that possessed a scent, even in a faint degree. The following varieties are of the strongest Clove scent and represent a few of the best and most popular kinds:

'My Clove' (shell pink); 'Bookham Clove' (real old Clove colour); 'Ellen Douglas' (silver grey or lavender); 'Surrey Clove' (maroon); 'Mrs. Andrew Brotherstone' (fancy); 'Distinction' (fancy); 'Lady Hermione' (a fine old salmon variety).

'Bookham Clove' is quite the strongest Clove-scented Carnation I have ever seen, and it owes its existence to a mild challenge thrown out by a colonial lady who came to England on a visit. She asked me one day what had become of the real old Clove of her girlhood days, asserting emphatically that most of the so-called 'Old Cloves' were different in colour and not the true Clove of fifty years ago; adding that the Edenside collection held no such gem as the 'Old Clove' of her father's Herefordshire garden, and that this genuine 'Old Clove' had a scent distinct from any other Carnation or any other so-called Clove that she had seen on her last visit to the old country. Nearly a year after I had an opportunity of acquiring two plants from a stock that had been carefully preserved in this old Herefordshire garden for sixty years. I was rather surprised to find my lady visitor's account perfectly true in every respect. The bloom from these two plants, instead of being the dull maroon peculiar to the Clove one finds in the cottage gardens of Surrey, was of a beautiful dark crimson-purple showing a glow of almost a wine shade, but the scent of those blooms was perfectly wonderful, the two blooms strongly perfuming a dining-room 22 feet by 18. Strange to say, the Clove perfume was

more apparent from a distance of 10 feet than when held close to the nose. The bloom, however, was small and the calyx was burst, yet there was the glorious scent and the strange, fascinating, wine-like colour. I thought of the lady's challenge, and there and then resolved to raise a Clove to beat it. That was ten years ago. The road was paved with many difficulties and disappointments, yet at last, after many failures, 'Bookham Clove' appeared on the seedling bed, its colour the precise shade of the genuine 'Old Clove,' but what an advance in every other respect! Its blooms were held erect on wire-like stems, its calyx was absolutely sound, and, I almost hesitate to assert, the flower was more powerfully perfumed. Yet that was the verdict of several members of the Floral Committee who gave this variety an Award of Merit in July 1914.

The third and last characteristic essential is a full flowering period, and I would here observe that the term perpetual, as applied to Border Carnation, is quite misleading. The meaning of the word, as there is no need to point out, is continuing for ever, or without ceasing. That always seems absurd to me, especially when one recalls the English spring, autumn, and winter. Of course, the blooming period in the south is longer than in the midlands and the north, but under the most favourable conditions the months in which bloom can be obtained from Carnations outdoors are June, July, August, and, in some years, part of September. Of course, all sorts of cases can be cited when bloom can be cut earlier or later, but, strictly speaking, the three months mentioned are the extent of the blooming period. Ten years ago I made some very thorough and expensive experiments, crossing the best Border Carnations with the best Tree Carnations and vice versa, in some years blooming as many as 5,000 seedlings. These, of course, were wintered in beds outside, and one particular bed I remember in the winter of 1909 consisted of 2,000 plants, and splendid bushy youngsters they were. Although we had a mild winter we had a lot of rain, and every plant collapsed after a sharp spring frost. I have never seen a bed of Hardy Border Carnations affected in this way. The following winter being dry, more than half survived of a bed of 3,000 plants, one only, 'Hercules,' being considered worthy of notice, a fine bold maroon self, lacking the incomparable form and petal of a good Border Carnation, yet a strong hardy and tried variety in the border. 'Hercules' was awarded a unanimous Award of Merit by the Floral Committee of this Society in June 1911. Its habit is as perpetual as the English seasons will allow, and I have seen blooms of this variety in May and in September. It winters well as far north as Aberdeen. However, regarding the matter from all points, it was considered advisable to discontinue the cross-fertiliza-tion of the two types, especially as the Tree or Perpetual Carnation imparted to the hybrids a far greater height than is desirable in a Border Carnation, and as a rule the clear-cut edge and incomparable form of the Border Carnation were entirely destroyed.

We had noticed that amongst the standard varieties of Border

Carnations there were several that invariably gave a second crop of bloom in the autumn. These were carefully cross-fertilized and seedlings again selected with the same habit, and thus, by careful selection, we have gained the full flowering period permitted by our English seasons.

Some time ago I received a letter from Miss KINGSFORD of Fulham, a well-known writer to the gardening papers on Border Carnations, and collaborator with Mr. H. H. THOMAS in the production of that useful little work "The Carnation Book." In her garden at Fulham she had a plant of the Salmon Carnation, 'Mrs. R. Gordon,' bearing 342 blossoms. This extreme floriferousness, of course, does not continue all the blooming period, but rarely can one visit a plant of this variety without finding bloom on it between the months of June and September.

These remarks indicate clearly enough that the Carnation is quite an easy, free-growing border plant. There is no closely guarded secret known only to experts and unattainable by the ordinary amateur; but, of course, on the other hand there is no royal road, paved with indolence and ease, that will lead to success without some little exertion and the intelligent knowledge of the simple wants and requirements of the plant.

I now propose to give a few short hints on the general cultivation of the Border Carnation, and, in dealing with the two extremes of soil, heavy and light, I always find that the value of a stiff clay soil is greatly enhanced by the addition of a lightening medium, such as horse manure and coarse road sand or mortar rubbish; whilst the light loams and chalky soils are benefited by incorporating ordinary farmyard manure. I have seen Carnations growing to a remarkable degree of perfection in stiff clay and in light calcareous soil. I have seen them grown with success on walls where little soil of any kind was visible. Altogether I consider the Border Carnation one of the most adaptable of plants in respect of environment and soil conditions.

Carnations are very easily raised from seed, and this is an excellent method where an abundance of bloom is the main requirement, though, if extra fine flowers are wanted a stock of plants propagated as layers from named varieties must be procured, and these in turn can be layered by the grower for the purpose of increasing his stock. If seed is purchased from a really good source, the resulting plants will give 80 per cent. to 90 per cent. of double flowers, and a few of these may be little if at all inferior to many named varieties. The seed may be sown any time during March or April, or, if the season is backward, it will not be too late if done early in May. As soon as the young plants have formed the second rough leaf, say about three or four weeks after germination, they should be pricked out of the seed boxes or pans, and planted out in prepared beds where, by September, they will have grown into strong bushy plants, sturdy enough to stand the frost, snow, and winds of any ordinary winter. During the first few weeks, when the growth is tender and soft, a sharp look-out must be kept for the Carnation maggot. Its appearance will

show in a whitish discolouration of one or more of the leaves. This is the track of the pest as it burrows its way inside the leaf towards the central stem. If found at this stage and killed, little or no harm will have been done, but if it is neglected or overlooked till the stem itself has been reached, the growing top of the plant will have been destroyed. If, however, it has not gone too far, side shoots will spring up from the base if the decayed part is removed, and a bushy plant will result, none the worse for its narrow escape. The maggot itself, a small cream-coloured grub about one quarter of an inch long, or less, according to its age when discovered, is the larva of a fly technically known as *Hylemyia nigrescens*; and there is no remedy against its ravages but hand-picking. Seedlings are much more readily attacked than older plants or layers.

If higher quality of flowers is wanted than that provided by seedlings, the grower must obtain a stock of named varieties which have been layered during the summer, and these will be ready to send out from a nursery in September and October. The beds should have been prepared and made ready for their occupants not later than the end of August, so that the soil will be thoroughly settled before planting time. The best time for this is during the latter part of September and early October. The layers, already well rooted, must be planted firmly, and will then have a few weeks to take thorough hold of the new soil before winter sets in, and they should grow away strongly in the spring with a better chance of acquitting themselves well the following summer than plants put in later in the year, or held over till the beginning of the growing season.

I would like to emphasize the necessity of firm planting, which is specially conducive to the well-being of Carnation growth. It also secures the plants from being knocked about in winter storms, and from being loosened in the soil by the action of frost which would seriously interfere with root growth.

As seedling plants make larger and freer growth than layers, I recommend these to be planted eighteen inches apart, with about fifteen inches for layers. This will give room for subsequent layering, and for hoeing to keep down weeds and preventing caking of the surface in hot dry weather.

Many people like to have other plants growing amongst their Carnations, but, on the whole, I think it better to devote beds entirely to them. May-flowering Tulips, however, or the early bulbous Iris, do not interfere to any great extent with the Carnations, as they bloom and mature their foliage before the latter reach the full extent of their development; so, if a lengthened period of flowering is wanted, I can recommend the interplanting of the above; or the choicer Narcissi would do equally well.

Both seedling Carnations and plants grown from layers produce many more buds than could ever come to perfection as flowers. It is wise therefore to thin out the surplus buds as soon as they can be handled. As we are now dealing with the Carnation as a border plant,

I need not refer to disbudding as practised by those who exhibit the blooms, but for a garden display a certain amount of thinning is certainly beneficial. Buds almost always form immediately at the base of each main bud, and these should certainly be removed. As regards buds arising from the leaf axils on the stem, four to eight of these may be retained according to the strength of the plant, the small buds below them in each case being nipped out when quite young.

Seedling plants, if well grown, may throw fifty to one hundred flowering stems, and if each of these is allowed to retain four good buds a fine show of blossom will result.

Should the weather be hot and dry, syringing during the evening or on dull days will encourage lusty growth, and at the same time check the ravages of thrips and green-fly. No artificial manuring should be needed if the preparation of the beds was thorough, but, on light soil especially, a mulch of rotted manure will be advantageous if applied a week or two before the beginning of the blooming season.

Until quite lately one was always recommended to attach calyx bands to the buds to prevent bursting, but that is a laborious practice, and there are now so many fine varieties whose calyces show no tendency to burst that this tiresome duty may be said to have been removed from the calendar of operations.

When seedling plants are in bloom, they should be gone over carefully to note any that are worth layering, whilst " singles," " bursters," and worthless sorts generally can be immediately rogued. Before the middle of July many of the plants will be ready for layering, and this operation can be continued also throughout the following month, although it must be borne in mind that early layers make the best and strongest plants. The process of layering is quite simple, and is really merely a form of pegging down. To hasten rooting, a slit is cut from the underside of the shoot, through a joint, and then pegged firmly into the soil, where it will start rooting in a week or ten days if kept just moist. In six weeks the layer will be strongly enough established to be severed from the parent plant, though, as there is no hurry to replant till September, a week or two longer may be given with advantage, especially if the weather has been hot and dry. Bearing in mind that a certain percentage of loss must be expected during the winter from wireworm, cats, and other causes, it is wise to put down more layers than are actually required. After filling the new beds, all surplus layers can be potted up, and kept in a frame or cold greenhouse during the winter to take the place of a possible casualty. In February or March they will come in very well for filling gaps in the beds where mortality has occurred from any cause.

Before concluding, I should like to say a word on the use of artificial or chemical manures and patent so-called plant foods. We have made many exhaustive experiments with every known kind, long since coming to the conclusion that the finest and most valuable manure or stimulant for Carnations of all types is sheep or cow manure, and soot used either dry on the beds or as a liquid. As a matter of fact,

Carnations of all types produce far finer stock and better bloom if grown in a compost good enough and rich enough to carry the plants from planting until layering. If the season is a dry one we find that watering with weak liquid manure is very beneficial, and always helps to develop strong grass—a great consideration if the plants are required to be layered.

To make it, take two gallons of fresh sheep manure and place in a sack with ½ gallon of soot; tie up securely and sink in a tub of water holding, say, twenty gallons; after two days squeeze the sack well and the liquid will be ready to use in a proportion of one pint to a gallon of water.

INVESTIGATIONS ON THE NARCISSUS DISEASE.

By J. K. RAMSBOTTOM, Research Student.

[Read before the Horticultural Club, May 8, 1917.]

SIX months ago, when the Royal Horticultural Society asked me to read a paper on the Narcissus disease, I thought I might find myself in the position of Canning's knife-grinder who had no story to tell. I however fell in with the suggestion that I should give a *résumé* of my investigations up to date. I was appointed in June last by the Royal Horticultural Society to investigate the disease of Narcissus commonly attributed to *Fusarium*, and but for the abandonment of the Daffodil Show my lecture would have been delivered before that Society. The Horticultural Club, on hearing of the abandonment of the Show, and knowing the keen interest taken in the Narcissus disease, invited me to deliver the lecture to its members. Hence my presence here to-night.

On taking up my appointment a note was published in the leading horticultural papers inviting bulb growers to forward diseased specimens to Wisley. As a result of the splendid response of growers, hundreds of bulbs passed through my hands even during the first few weeks of the investigation, and thousands of slides were prepared. I was also given the opportunity of visiting a number of nurseries and bulb farms, and given practically a free hand on the approach of the lifting season. It is with much pleasure that I acknowledge the great assistance and exceptional courtesies I have received from many growers.

When the investigation was commenced the disease was usually attributed to *Fusarium bulbigenum*, chiefly, no doubt, on account of the work of the late Mr. MASSEE, which was published first in the *Kew Bulletin* and then as a Board of Agriculture leaflet—but which was very incomplete.

An investigation by Miss WELSFORD at the Imperial College of Science, which had been in progress for two years, was said to point to a fungal or bacterial origin of the disease. Special attention was therefore centred on the possibility of *Fusarium* being the cause of the malady; but it was soon seen that this fungus was of remarkably rare occurrence. When it was present it was always in association with a parasitic eelworm, and it was at first thought that there was possibly some connexion between the two organisms. As the work advanced, observations in the field and laboratory showed that the parasitic eelworm was the main factor to be considered. This eelworm agrees in all respects with the descriptions of *Tylenchus devastatrix*, Kuhn.

When the members of the Narcissus Committee of the R.H.S. visited

Wisley in July last, a small exhibit was arranged in the laboratory, and I then expressed the opinion that eelworm was probably the cause of the trouble, but inoculation experiments were necessary before any definite statement could be made. These have since been carried out.

Bulbs attacked with the eelworm disease exhibit certain symptoms which are now well known and easily recognizable. No one symptom can be regarded as definitely characteristic of the disease. The disease may show itself in the bulb, or in the foliage, or both. The fleshy scale leaves, sometimes one, at other times a number, of an infected bulb, show a distinct brownish colour, and when the bulb is cut across horizontally the diseased scale leaves take the form of rings (fig. 17); hence the name "ring disease" which is a descriptive and suitable popular name for the disease. It is in this brown mass that eelworms in all stages of growth are readily discernible when the tissue is teased and examined under the low power of the microscope. The bulb may be so affected that the growing scales and embryo flower are diseased. If so, the bulb when planted, if it grows at all, throws up sickly yellow foliage which twists and turns in all directions (fig. 18). The leaves are silky and spongy in texture and marked with long brownish diseased areas, at times running along the whole edges of the leaves, while irregular whitish eruptions caused through the breaking of the epidermis may appear (fig. 19). The flowers resulting from such bulbs are stunted in growth, as the photograph (fig. 20) clearly illustrates. The growth of diseased bulbs is generally much retarded as compared with that of healthy bulbs, but the extent of this depends upon the degree of infection. Healthy bulbs and diseased bulbs of the same variety were planted in pots, grown in cold frames, and given exactly the same treatment. The healthy bulbs flowered at a time when the diseased bulbs had made but an inch or two of growth (fig. 21).

In cases where the bulb is but slightly diseased, the growing leaves and flower may be unaffected. The foliage then appears, and probably is, perfectly healthy, so that though the leaves show no signs of the disease, it does not necessarily mean that a healthy crop of bulbs will be harvested. It may be regarded as certain, where sickly, deformed yellowish foliage is seen, even when an inch or two of growth has been made, that the bulb is affected, and no time should be lost in carefully removing it.

After many failures, a method was devised by which *Tylenchus* could be successfully isolated and grown in pure culture, and inoculation experiments were commenced without delay. On September 7 a few eelworms were pricked into the necks of healthy bulbs by means of a sterile needle, and the bulbs planted in steam-sterilized soil in pots and stood in a cold frame, where they remained throughout the experiment. Control experiments were arranged, healthy bulbs being grown in sterilized soil, the necks pricked with a sterile needle, but no eelworms introduced. On February 19 (six months after inoculation) the bulbs were lifted, and eelworms, which were found in all

Fig. 17.—A Narcissus Bulb cut in half, showing the dark Rings of damaged Scales due to Eelworm attack.

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FIG. 18.—NARCISSUS ATTACKED BY EELWORM.
Showing stunted and contorted foliage characteristic of a bad attack.

stages of development and in great numbers in the inoculated bulbs, had travelled down from the neck along the fleshy scales and entered the basal plate, and in doing so had left the brown stain so characteristic of a diseased bulb. There was not a single instance in the dozen or so bulbs inoculated which did not show these characteristics in a marked degree (fig. 22, A). The bulbs in the control experiment were perfectly healthy (fig. 22, B).

Another series of inoculation experiments was arranged in the greenhouse. Healthy bulbs were grown in pots, and on February 22, when the flowers were just bursting into bloom, the plants were inoculated in the following ways :—

(*a*) Eelworms introduced into the wound left from picking off the undeveloped flowers,

(*b*) Eelworms pricked into the leaves 4 inches above the neck, and

(*c*) Eelworms placed on uninjured leaves at the same distance from the neck;

(*d*) Used as a control.

In less than a week evidence of disease was apparent. In (*a*) the flower stalk rotted and showed a wrinkled, marbled appearance; it also became very deformed, swollen, and angular, as fig. 23 clearly shows. The same plant is shown in fig. 24, A. In (*b*) and (*c*) (fig. 24, B, C) the leaves soon lost their rigidity and fell over the sides of the pots in all directions, and showed the same wrinkled and distorted appearance as in the inoculated flower stem. Fig. 25 shows the invasion at (*a*) of the uninjured leaf referred to in (*c*) above, by the eelworms, with a healthy leaf for comparison. On April 20, eight weeks after inoculation, some of the plants were lifted and cut. The photographs (figs. 26 and 27) demonstrate that the eelworms had not been inactive. Infection occurred in all cases where inoculation was attempted, and none of the control plants showed the disease.

Tylenchus devastatrix was first described by JULIUS KUHN in 1858 as being the cause of a disease in *Dipsacus Fullonum*, the Fuller's Teasel, under the name *Anguillula dipsaci*; but as he afterwards found that the same eelworm could attack oats, buckwheat, and other plants, he considered the name *Anguillula dipsaci* too restricted, and, disregarding the customary rules of priority, changed it to *Anguillula devastatrix*. BASTIAN, who did important work on the classification of eelworms about 1860, incorporated *Anguillula devastatrix* with several other eelworms in the new genus *Tylenchus*, and the eelworm with which we are now dealing became known as *Tylenchus devastatrix* Kuhn. In 1881 PRILLIEUX worked on the eelworm malady of Hyacinths. To this eelworm he gave the name of *Tylenchus hyacinthus*, while in 1883 BEYERINCK published a paper on the eelworm malady of Onions, which at that time was spreading rapidly throughout Holland, and which he attributed to *Tylenchus allii*.

In 1888 RITZEMA BOS, one of our foremost Nematodologists, definitely proved that *Tylenchus hyacinthus*, *Tylenchus allii*, and *Tylenchus devastatrix* were one and the same species. The same

worker, in the valuable contribution "L'Anguillule de la Tige," gives a list of some forty plants which are susceptible to the attacks of *Tylenchus devastatrix.* This list includes, among our principal food crops, Rye, Oats, Onions, and Clover, and in a less degree Barley and Wheat. Among flowering plants, Hyacinths, Scillas, and *Galtonia candicans* are included in the list. Narcissus is not, however, mentioned. Some of our commonest weeds, such as Sweet Vernal Grass, Meadow Soft Grass, Annual Meadow Grass, the Buttercup, the Daisy, and the Plantain are also liable to infection.

In 1900 RITZEMA BOS put forward the biological-strain theory, which, in brief, is that *Tylenchus devastatrix* becomes so adapted to a particular species of host plant after growing on it for several generations, that it will not attack with any severity any other species. Further, taken from such a second species, it will not attack the original host with severity until after several generations have passed. For instance, according to him the Narcissus strain is not likely to affect onions with any severity, and vice versa, although the two strains are absolutely indistinguishable under the microscope. In like manner, it has been suggested by several investigators that the root-knot eelworm *Heterodera radicicola* may show similar biological strains with no apparent morphological differences.

In conjunction with the series of inoculation experiments performed last September, to which reference has already been made, certain experiments were carried out to test the truth of this theory. Healthy bulbs were planted in sterilized soil and onion seed sown on the surface. The pots were watered twice with eelworm cultures (the eelworms being originally taken from Narcissus bulbs) at the interval of a fortnight. The eelworms had their original diet to feed upon, but, in contradiction to the biological-strain theory, all the seedling onions were attacked. Another similar experiment was made by sowing onion seeds in sterilized soil in pots and watering once before germination with water containing the Narcissus strain of eelworm. Six weeks after sowing, although the seed showed a moderate germinative capacity, practically none of the seedlings carried the seed husk at their tip, and abnormal twisting or bending was very noticeable. The young plants were of a lighter green colour than those in the control pots. The seedlings in the infected soil gradually died off, and on examination were found to contain *Tylenchus* in numbers. I have a photograph showing the characteristics of the diseased seedlings, illustrating especially the swollen bases and deformed growth.

Scilla nutans has also been successfully cross-inoculated with the Narcissus strain of *Tylenchus*, and a number of other crops are under observation.

This phase of the subject has been treated in detail because it opens up a very wide field and is of great economic importance on account of its bearing on the rotation of crops. For instance, in parts of the country where bulbs are grown in rotation with agricultural crops, it is of little use, in attempting to control Narcissus disease, to grow

crops liable to infection, and in which eelworm can tide over until the ground is again occupied by bulbs. Whilst on a visit to Spalding last July, the susceptible crops in the district were examined for eelworm. In two instances onions, lucerne, and clover (all susceptible crops) were found growing in close proximity to diseased Narcissus bulbs, but it must be confessed no damage appeared to have been caused by eelworm. One criticism I would reply to in advance. The cross-inoculation experiments at Wisley have been conducted under glass and many factors eliminated which come into play in the open air. However, it seems certain that the problem of rotation will have to be considered if a successful cure is to be found.

An important question under consideration is to ascertain in what manner bulbs become affected, and a series of experiments, which are not yet completed, has been arranged. It appears from field observations that the disease commences in the neck of the bulb. The leaves at the surface and below the ground level become a decayed squashy mass, and, in consequence, they lose their elasticity and topple over in all directions. These leaves do not show the twisting characteristic of the diseased foliage from a diseased bulb. This decay in the neck is usually evident in late May and early June at a time when the foliage is withering, and the symptom is sometimes confounded with the natural decay of the leaves. Many growers are of the opinion that moist, dull, warm weather favours the spread of the disease at this stage, and such conditions possibly aid the development of eelworms and render them more active. Exactly how the eelworms gain an entrance has yet to be shown. It is generally believed that foliage injured by frost and other external agencies offers a ready means of access. This may be so, but the leaf-inoculation experiments prove that eelworm is capable of itself of gaining an entrance owing to its possession of a spearing apparatus—a needle-like structure present in its gullet. In the case of a healthy bulb planted in infected soil the hard, brittle outer scales would afford natural resistance to the entrance of the eelworm, and in preference it would attack the soft growing foliage. In any case, the eelworms usually attack the leaves at the neck, and this is a possible explanation of the decay of the foliage at this point. Once inside the leaves, the *Tylenchus* makes rapid downward progress to the basal plate, where it appears to find better conditions of growth. Here the eelworms propagate most freely, the basal plate splits away from the bulb, and often the eelworms are to be seen in masses resembling cotton wool hanging from the base (fig. 29). At this stage the eelworms leave the bulb *via* the broken basal plate and enter the soil, attack other bulbs, and so spread the disease. The bulb-mite and fungi, possibly including *Fusarium*, then gain an entrance.

In cases where flowers are picked (as in the case of the Daffodil-flower industry, where many flowers are picked in the bud stage and opened indoors) the wound so left affords a ready means of entry for eelworm from the soil. In order to obtain a long flower-stem, they are picked as far into the neck as possible, sometimes below the

ground level, and an ugly wound results. No bulb treated in this manner can be expected to remain free from disease in an infected soil, and the practice doubtless helps to spread *Tylenchus*. Wherever it is practicable, the flower stalks should be cut an inch or so above the ground.

When bulbs are in a dormant state it is a very difficult matter to distinguish one which is healthy from one which is slightly diseased; in fact, it seems quite impossible without cutting open the bulb. Accounts have been heard of many growers' experiences in this matter. For instance, bulbs have been carefully hand-picked, and those passed as apparently sound have been "trayed." Within a fortnight the bulbs have again been re-examined and numbers destroyed as unsaleable. This goes on and on, so that it is not surprising to hear the remark that the disease spreads rapidly in storage. I do not think it is a case of a diseased bulb affecting its neighbours to which the cause of this rapid spreading can be attributed, but rather that the bulbs passed as sound were slightly diseased, and after a week or more the eelworms had made their efforts recognizable. That such seems likely is seen from the following: healthy bulbs have been placed in trays among diseased ones and left over a period of three months, at the end of which time the latter were a decayed and rotten mass and the healthy bulbs still plump and hard, but probably not free from eelworms on their outer scales. No trace of eelworms could be found inside the healthy bulbs. It is not to be implied that no harm will result by storing the bulbs under bad conditions. Certain factors, such as humidity of atmosphere and temperature, may aid to bring about the decay of bulbs very rapidly.

For experimental purposes it was necessary to divide the bulbs into two classes, viz. healthy and diseased, and a simple method was devised in order to distinguish them. As clean a sample as it was possible to obtain was classed as healthy, and a diseased stock was obtained of the same variety. Of the diseased stock all bulbs which were evidently badly diseased and incapable of growth were discarded. The others were topped by cutting off a quarter of an inch or so of the bulb at the neck. After a little experience it was possible to distinguish with confidence the brown scale affected with eelworm from the brown scale resulting from natural decay and withering. The healthy bulbs were treated in the same manner. Topping is not detrimental, providing it is performed shortly after the bulbs are lifted. At such a time the growing part is not touched, and the bulb heals its wound before planting time arrives. A precaution should be taken to dip the cut neck in sulphur as a preventive against other diseases. There is another point in connexion with the topping of bulbs which must not be lost sight of, more particularly in compound bulbs. It sometimes happens that the eelworm spreads from the neck of the parent bulb down to the basal plate, along which it travels to the offset. Should the disease originate in the offset it may in like manner affect the parent bulb. The disease then spreads upwards from the base, usually

FIG. 19.—NARCISSUS KING ALFRED ATTACKED BY EELWORM.
Showing the eruptions on the foliage.

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FIG. 20.—NARCISSUS 'GOLDEN SPUR' ATTACKED BY EELWORM.
Showing the stunted growth of the flower.

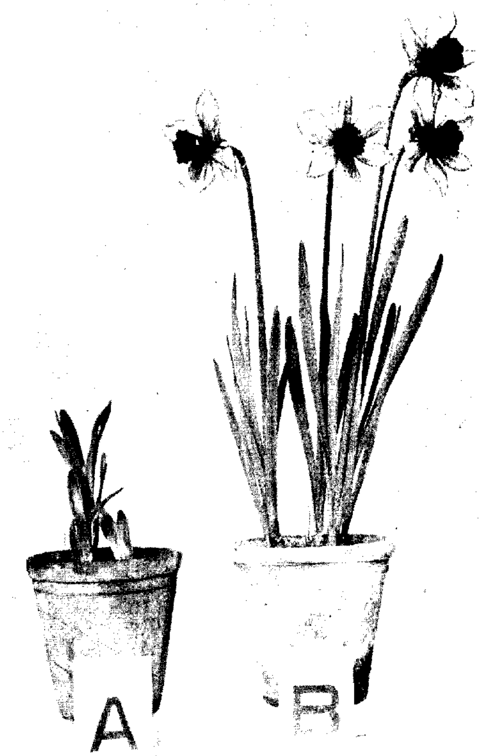


FIG. 21.—NARCISSUS 'SIR WATKIN,' SHOWING THE DIFFERENCE IN GROWTH OF BADLY DISEASED BULBS (A), AND HEALTHY ONES (B).

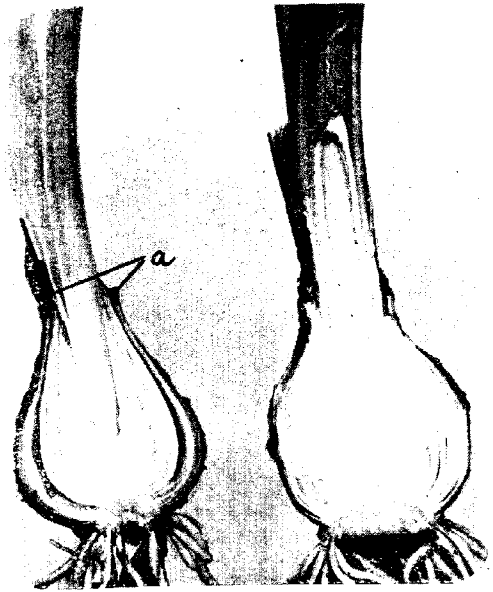
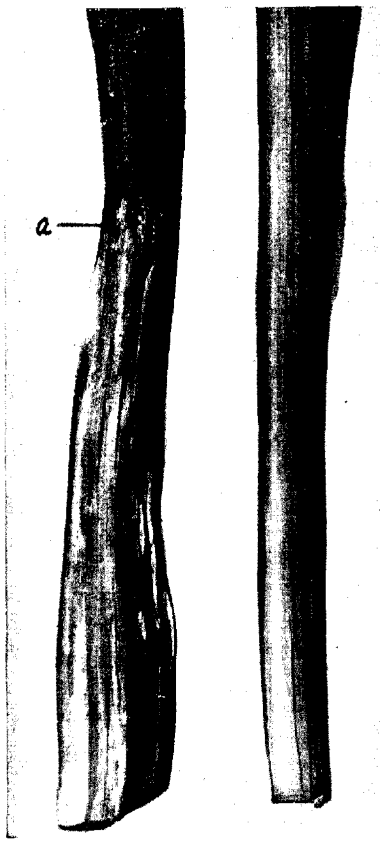


FIG. 22.—BULB A, SIX MONTHS AFTER ARTIFICIAL INOCULATION OF DORMANT BULB AT POINT (a) WITH EELWORMS. Showing destruction of whole scale. (Bulb B, not inoculated and grown in [illegible]

FIG. 23.—NARCISSUS INOCULATED WITH EELWORMS AT BROKEN END OF FLOWER-STALK (a). *Cf.* Fig. 26.

FIG. 24.—EELWORM ATTACK ON NARCISSUS PLANTS.
A, Inoculated in broken flower-stalk. B, Inoculated in leaves. C, Inoculated by contact on uninjured leaves. D, Healthy plant not inoculated.



A B

FIG. 25.—A, UNINJURED LEAF OF NARCISSUS INVADED BY EELWORM.
B, A healthy leaf for comparison.

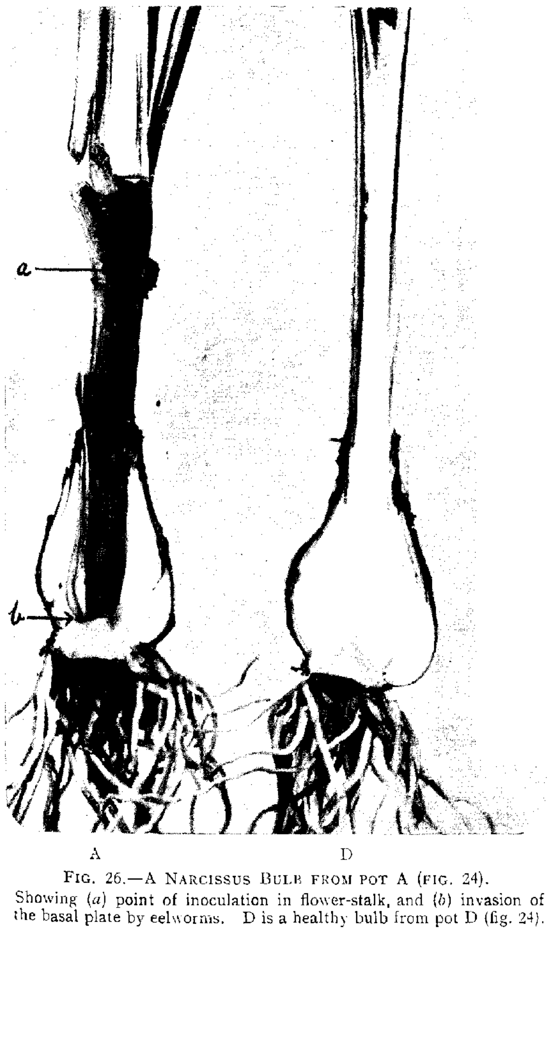


FIG. 26.—A NARCISSUS BULB FROM POT A (FIG. 24).
Showing (*a*) point of inoculation in flower-stalk, and (*b*) invasion of the basal plate by eelworms. D is a healthy bulb from pot D (fig. 24).

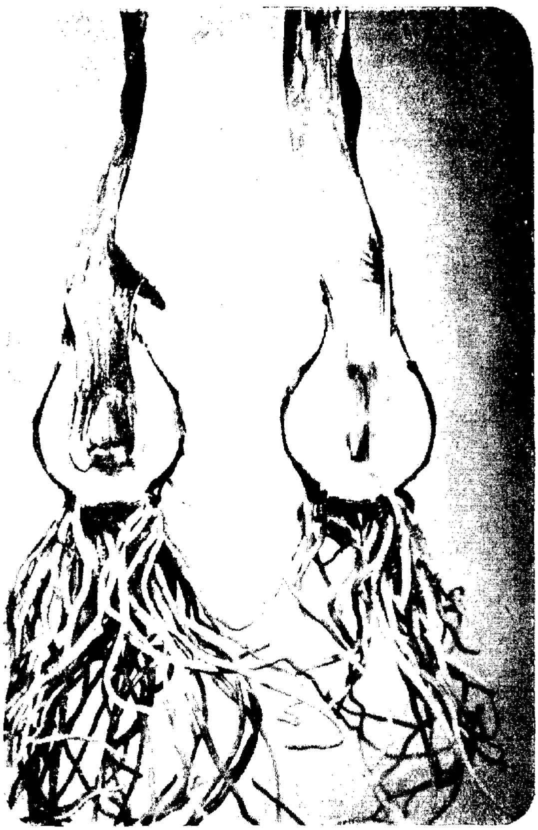


FIG. 27.—NARCISSUS BULBS FROM POTS (B) AND (C) (FIG. 24).
Showing invasion by eelworms from inoculations in the foliage leaves.

[To face p. 57.

attacking all the scale leaves. In such cases each "nose" of the bulb must be lopped, otherwise there may be no trace of the malady if one "nose" only is cut. Bulbs thus affected, however, generally exhibit rottenness at the base.

It will be of interest to hybridists to mention the fact that *Tylenchus* has been found in both the mature and immature carpels of the flower. In the mature carpel examined no seeds had formed, but it is quite possible that had seeds developed they would have contained eelworms, judging from the analogous case of oats, which when affected in the grain gives the plant an appearance as though attacked by Ergot. It has often been said that the disease never makes its appearance in seedlings until after the bulb flowers. This seems unlikely, and experiments to test it are under way. One raiser went so far as to say that as soon as he named a seedling he killed the bulb. On going into details of cultivation, the writer was informed that the seedlings were pricked into beds in cold frames, where they remained until they were of flowering size, and then they were planted in the open ground. The bulbs flowered the first year, and those found deserving of a name retained. The next year the disease made itself evident, and thus this hybridist was, no doubt, justified in making the above remark. If, however, the seedlings had been pricked out into beds in the open air instead of in cold frames, the results might have led him to a different conclusion. If onions can be, and are, affected as soon as they germinate, there is every reason to assume that Narcissi can be likewise attacked.

During the investigation at least two species of *Fusarium* have been isolated in pure culture, and plants have been inoculated in the following manner: (1) on the wound left by removing the flower stem, (2) on the injured foliage, and (3) on the uninjured foliage. The plants were grown under bell glasses in the greenhouse at a temperature of about 60° F. The experiments are at present in progress, but the fungus is of very slow growth, and the attack upon the foliage cannot be compared with the rapidity with which *Tylenchus* affects plants grown under exactly the same conditions, inoculated at the same time and in the same manner. When healthy leaves are placed on moist blotting-paper in Petri dishes and kept at room temperature the *Fusarium* makes rapid growth both on injured and uninjured leaves.

Many bulbs affected by *Fusarium* were found in the storage sheds of a large bulb farm in the south of England, and in every case the *Fusarium* had occupied the damaged bases of bulbs already affected with eelworm. This *Fusarium* appears to be the species described by Mr. MASSEE as being the cause of the disease. Another species was found at Wisley, appearing in salmon-stained tissue of eelworm-affected bulbs.

Bulbs have also been received affected by *Merodon*, *Sciara*, bulb-mite, and *Eumerus*, while among fungi *Sclerotinia bulborum*, *Phyllosticta Narcissi*, and *Stagonospora Narcissi* have been seen; the two

latter appear on the leaves and have not previously been recorded for this country.

A quarter of a century ago there was very much written in the horticultural press regarding the mysterious disease known as "basal rot." It will be interesting to hear more of this disease from present-day cultivators, as it is not at all certain whether it is in any way connected with the one under consideration. In an article written in 1894 by the Rev. WOLLEY-DOD on "basal rot" the word "eelworm" is mentioned, but as to whether it was of a parasitic nature or a free-living form no remark was made. I have yet to see a bulb affected with a basal rot other than that due to eelworm.

A delicate method has been devised for testing soil for the presence of eelworms. Ten grams of soil are ground up in a mortar with 100 cc. of water and the muddy liquid poured into the cups of an electrical centrifuge. The centrifuge is then worked at a fairly high speed until the soil lies at the bottom of the cups. The opalescent liquid is then decanted and spun a second time at a higher speed; the sediment now sinking to the bottom contains the eelworms, together with other living organisms of the soil. To apply this test to large areas of ground, a large number of samples would, of course, need to be taken.

It is a difficult matter to offer anything like a complete survey of the work in hand, inasmuch as it consists of a large number of inter-related experiments from which at present no results have emerged, though the sum of the experience gained indicates clearly enough that eelworms are responsible for much more damage than has hitherto been thought—if not the whole of it.

With regard to the treatment of the disease, a phase of the investigations which is occupying the major portion of my time—no definite statement can yet be made. A satisfactory method may in time be found, but it is feared the investigations will require a good deal of patience.

The remedies, if such are found, will need to be tested on a large scale or proved to be what are generally termed "commercial propositions" before they can be generally applied. The difficulties are chiefly connected with the conditions under which *Tylenchus* can exist, and therefore concern the most suitable method of attack.

Tylenchus can be dried for lengthened periods looking as if dead, yet still retaining the power of resuming vital functions on being moistened. As far back as 1744 this power possessed by eelworms was investigated.

An experiment was performed last August by placing eelworms on slides in a desiccator for eight weeks. On examination they were found to be curled up like Catherine wheels, but on application of moisture a large percentage showed the eel-like movement when examined three hours later. Dr. RITZEMA BOS has investigated this power of *Tylenchus* with the thoroughness which stamps most of his work. He has shown that unsegmented eggs of *Tylenchus* might be safely dried

for a period of two months, but if allowed to remain dry for a year only about one-third recovered on being moistened; the other two-thirds were dead. Eggs, however, of which the contents were divided into 2, 4, 8, or 16 divisions, could not bear desiccation for even six days. Eggs further advanced and containing the eelworm in embryonic condition could remain in a state of suspended animation for six months (possibly longer) without losing the power of recovery on the application of moisture. The power of larvæ to regain conditions of active life after desiccation was found to be very great, and the results of experiments carried out by RITZEMA BOS showed that after suspended animation during a period of two and a half years they returned to their normal state. The adult *Tylenchus* (that is, those in which differences in sex are discernible) could not support life under desiccation.

From the results gained it is possible to suggest some general principles which should guide the attempt to find effective and economical remedies and preventive measures. There seem to be four possible interrelated ways of this: 1. Rotation; 2. Treatment of infected ground; 3. Treatment of bulbs; 4. Trap or "cure" cropping.

Rotation is included among the measures of prevention as it is of importance to give such a rotation as will not give a crop liable to be attacked in immediate succession to one which is known to have been infected with eelworm. Oats, onions, and clover are the crops which suffer most severely with us; but many other plants are liable to be attacked. When a field of oats or clover, for instance, is infected, it is difficult to clear and also to prevent the attack being carried about in manure, as a portion of the eelworms, very possibly most of them, customarily leave the dying plants and go into the soil; some are carried away with the cut crop, and, being mixed up in the straw with farmyard manure, are presently carried out again and spread quite uninjured on clean fields or perhaps in the very fields from which they came, in readiness to attack a susceptible crop—Narcissus, for example—if it is planted down in such fields.

It should also be borne in mind that eelworms can be conveyed in infested earth, such as clings to wheels of carts and ploughs, to boots of workers and to farm implements, and, from their power of propagation, a small beginning makes much trouble. To carry out the rotation so as to starve out the eelworm, the crops planted must be immune towards nematode attack, so that the larvæ in the soil cannot find nourishment. The crop grown should be economically profitable; and, if possible, it should be such as to enrich the land, or at least not impoverish it. The crop should be one of vigorous growth, so as to choke out all weeds or other plants which might harbour eelworms and permit of their development.

An ideal method of starving out the eelworm would be to allow the ground to lie fallow for a long period, keeping it free from weeds by thorough cultivation. It is evident that by such a method the

eelworms would be ultimately starved out; but the method is impracticable in the majority of cases because of its costliness.

Treatment of Ground.—Trenching can be applied in small areas, and to bury the eelworms as low as possible would do much to lessen the danger of attack. On larger areas ploughing with a skim coulter attached will also bury the eelworms to a fairly low depth. To resort to ordinary ploughing or digging would merely aid in distributing the eelworm over a larger area than previously. In the "Journal of the Board of Agriculture" for 1913 there appears a contribution on "Clover Sickness," in which it is stated that "it has been proved that when eelworms are buried to a depth of 5 in. they are killed." I have, unfortunately, not yet succeeded in tracing a record of the experiments which led the writer to arrive at these conclusions. Bulbs planted 8 in. deep have been found on lifting to be badly diseased, but the infection may have taken place near the soil surface.

Rich manuring, so long as there is no risk in bringing eelworms to ground in infested manure has been advised for other crops. One recipe found to answer well for attack in oats and onions was:

Sulphate of ammonia . . .	4 parts.
Steamed bones . . .	2 ,,
Sulphate of potash . . .	1 part.

This was applied at the rate of 1½ cwt. to the acre, followed by a dressing of two cwt. of sulphate of ammonia to the acre. This mixture gave such a luxuriant growth that in a little more than a fortnight after the second dressing the unhealthy plants, if any remained, ceased to be noticeable. Sulphate of potash is also confidently recommended. Applied at the rate of 3 cwt. to the acre, it answered admirably for infested oats, and no doubt such a dressing applied to ground occupied by bulbs might definitely help the plants to resist the attacks of eelworm by increased luxuriance and by reason of the potash hardening the leaves in texture and so impeding the entrance of the pests. It must be clearly understood that these experiments refer to the onion and oat crops alone. Potassic manures are, however, difficult to obtain at the present time, and it is very doubtful if fertilizers can be depended upon to exterminate eelworm. All measures calculated to stimulate vigorous and healthy growth are serviceable in supporting infested plants, and it is hoped to give this question of manuring the fullest consideration next season.

The types of soils in which the disease has appeared have been noted, but as far as observations were made the eelworm exists equally well in heavy and light ground.

It has been seriously proposed to use steam to destroy eelworms in the field, in view of the fact that this treatment has met with great success when used in the greenhouse for cucumbers and tomatos attacked by the root-knot eelworm. No experiments have been made in this direction owing to the expense of the undertaking. A very large boiler and thousands of feet of perforated piping would be

FIG. 28.—NARCISSUS BULBS.

Showing (A) the typical appearance of the neck of a healthy bulb, and (B) the broken-down neck of a diseased one.

[To face p. 60.

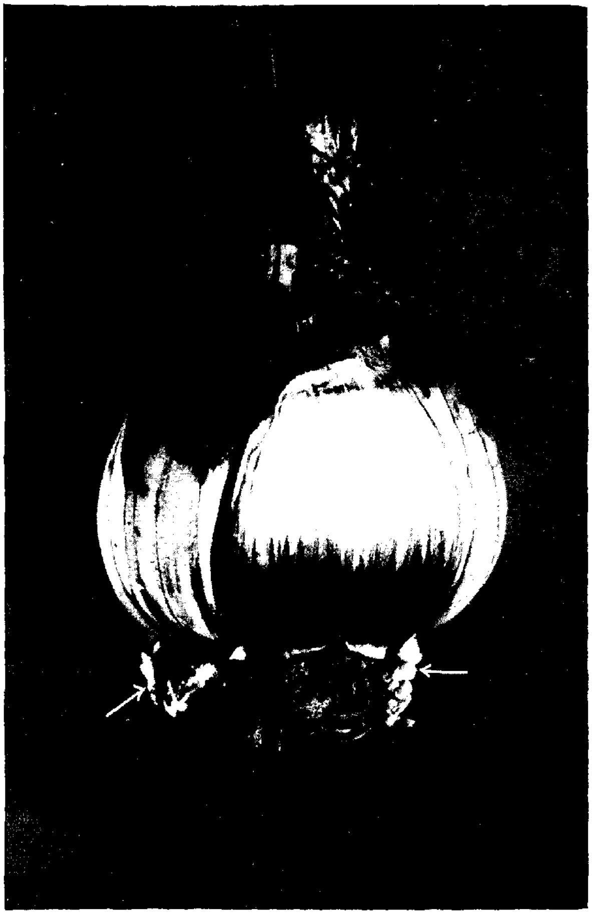


FIG. 29.—NARCISSUS BULB ATTACKED BY TYLENCHUS.
Showing protruding masses of eelworms at base.

[To face p. 61.

necessary in order to treat the soil by the greenhouse method, and it is doubtful if the treatment would be beneficial. Small areas or beds, especially those to be occupied with seedlings, might be profitably steam-sterilized by the inverted-pan method. Sterilization with chemicals such as formaldehyde, toluol, carbon bisulphide, napthalene, &c., offers possibilities of cleaning infected ground, but the larger the area the greater are the difficulties to be contended with in effectually carrying out the treatment.

The treatment of bulbs by soaking has received much attention.* Last autumn about 3,500 diseased bulbs and the same number of healthy ones were treated in dozens with a large number of different chemical solutions. The minimum time for soaking was 18 hrs., and the maximum 96 hrs., with periods of 24, 48, and 72 hrs. intervening. In most cases different strengths of the same chemical solutions were employed, as it is evident that where the bulb is damaged by a liquid that liquid cannot be employed. Eighteen hours was taken as a minimum time, as it was thought that no solution could penetrate the bulbs sufficiently in less time to be effective. All the bulbs were topped. Recent observations show that the bulbs have been killed in some instances; at any rate there are no signs of growth at the present time.

The warm-solution treatment of bulbs has been tried, and healthy and diseased bulbs have been soaked in water and chemical solutions of various strengths for 1, 2, and 4 hours and at a temperature of 43–44° C., 46–47° C., and 49–50° C. in each series. Healthy bulbs soaked in water and chemical solutions at the last-named temperature have been materially damaged, but the experiments are such that the results cannot be recorded until the bulbs are lifted.

HEWITT recognized some time since that *Tylenchus* was connected with the disease, and in a paper entitled "Eelworms in Narcissus Bulbs," published by the Department of Agriculture and Technical Instruction for Ireland in 1912–1913, recommends soaking the bulbs in copper sulphate solution at a strength from 5½ per cent. to 7½ per cent. for 17 hrs. On a recent visit to Ireland it was understood from one firm who had worked in conjunction with HEWITT that the treatment advised had been abandoned as the results did not prove satisfactory. HEWITT died in the midst of his investigation, and the published pamphlet is a record of his unfortunately uncompleted work.

Coupled with the warm-solution treatment, a series of experiments were performed with the Reichert thermal stage, by means of which apparatus it is possible to record, with some degree of accuracy, the length of time an eelworm is capable of life at a fixed temperature. Between 43 and 44° C. all eelworms were killed at the end of 45 minutes. At a temperature between 48–49° C. the eelworms succumbed at the end of 15 minutes; 52–53° C., 11 minutes; 53–54° C., 9 minutes; 55–56° C., 9 minutes; and 57–58° C., 5 minutes. The effect of temperature on the eggs was not considered.

No matter in what manner the bulbs are treated, it is courting

* See p. 65.

disaster to plant again in infected ground, and land which has never before been utilized for bulb cultivation is not necessarily free from *Tylenchus*, seeing that this eelworm is capable of attacking some of our commonest grasses and weeds.

Trap or " Cure " Cropping.—In 1880 KUHN devised a method of reducing the injury caused by the eelworm *Heterodera Schactii* in sugar beet, based upon the principle of trapping the eelworms in some susceptible plant and destroying the crop before the nematodes again entered the soil. He used a variety of rape for the trap crop, which was sown and removed from three to five times in the season. The number of eelworms was reduced by this method, and profitable crops could be grown again for several years. This method has more recently been employed in America for controlling the root-knot eelworm (*Heterodera radicicola*) but without success. For the eelworm under investigation a suitable trap crop may be found, but it will have to be one of which the seed is cheap, of easy culture, showing great susceptibility to attack, of quick growth, and which can be readily removed.

It appears to be generally held by growers that bulbs naturalized in grass escape the attacks of *Tylenchus*. If this be true, can it be that certain grasses attract the eelworm, or that soil conditions of grass land, such as lack of air, are unsuitable for the development of eelworm ? Or is it that certain grasses excrete toxins which render the soil unfitted for the eelworm ? On the other hand, bulbs grown for naturalizing are generally planted in drifts and left undisturbed for years, and as a consequence grow freely, so that, should any succumb to the disease, they are not missed. One large grower in Guernsey seems so convinced that bulbs in grassland are unaffected that he has left his beds unweeded and is experimenting in other directions.

Bulbs which have been left in the ground from lifting and thrown into the hedges when the land was cleaned for the next crop have been seen to make very luxuriant growth under such conditions, but whether the bulbs were healthy or diseased in the first place was not ascertainable.

In this country the treatment of Narcissus bulbs attacked by eelworm had received no attention except from HEWITT. Last July, when I had convinced myself that eelworms were probably the cause of the disease, I wrote to Prof. RITZEMA BOS concerning *Fusarium*. He replied as follows :

" I can assure you that I never have found in Holland a *Fusarium* disease in daffodils (Narcissus).

"Miss Dr. JOHANNA WESTERDYK in Amsterdam writes that a bulb-grower in Holland had sent diseased daffodils to Mr. MASSEE, who had informed him that he (Mr. MASSEE) stated them to be infected by *Fusarium*. Mr. MASSEE says that first the leaves of *Fusarium*-diseased daffodils show yellowish-coloured spots, which are soon covered with *Fusarium* ; afterwards the bulbs are infected, and show brown circles when the top is cut off.

"Miss JOHANNA WESTERDYK never found *Fusarium* on the yellowish

spot of the leaves; sometimes she could make cultures of a *Fusarium* living in diseased bulbs, but infection of sound bulbs had no results, except as it seemed in one single case. Miss JOHANNA WESTERDYK doubts whether the *Fusarium*, which appeared on the diseased bulbs, was indeed a parasite. She could not state whether the *Fusarium* on her bulbs of Narcissus was identical with *F. bulbigenum* Massee. She found no chlamydospores in the leaves, as did MASSEE; for the rest, the conidiophores and the conidia, which she studied on the bulbs, showed a great resemblance to those described by Mr. MASSEE, but the description of Mr. MASSEE's *Fusarium bulbigenum* is too incomplete for it to be possible to identify it with a certain *Fusarium*.

"The symptoms of the disease of daffodils, ascribed by Mr. MASSEE to his *Fusarium bulbigenum*, show a very great resemblance to those which are caused in the last years to daffodils by *Tylenchus devastatrix*, which since some two or three years has begun to attack also this genus of bulbous plants; and it seems very probable to me, that, in the case of MASSEE's disease of daffodils, the attack of *Fusarium*, when present, is only of a secondary character, *i.e.* that this fungus lives in the bulbs, sometimes also in the leaves, as a saprophyte, whilst the real cause of the disease is another, in most of the cases *Tylenchus devastatrix*.

"So my opinion is that there exists no real *Fusarium*-disease in daffodils; but should there be such a disease, I can state that I never have found it in Holland. From this you see that I am unable to give you any information on bulbs affected with *Fusarium*."

I then wrote to Dr. WESTERDYK, Director of the Pathological Laboratory of Amsterdam, asking her to enlighten me on certain points in the investigation. In her reply she informed me that she was engaged upon the study of *Narcissus* bulb diseases in general, but that she thought eelworm was the most serious, although it had only been known in Holland for one year. Contributions from Dr. WESTERDYK have appeared in a Dutch trade paper, and I have to thank Mr. PETER R. BARR for his kindness in sending me a number of her articles which I received two or three days ago. On glancing through the contributions it is surprising to see that England is persistently mentioned as being the original home of the pest, but how the eelworm can have been responsible for the havoc it has made there in one year I cannot say. So serious is the trouble that another investigator, Dr. VAN SLOGTARE has been appointed by the Dutch Government to make a special study of the disease.

Miss WELSFORD, working at the Imperial College of Science, has, I understand, now come to the same conclusion as Dr. WESTERDYK, Mr. HEWITT, and others had already reached, and to which I was quickly forced by the results of the observations and experiments which I made at Wisley and elsewhere.

The origin of the first outbreak of the disease in this country cannot be traced. Some growers say it came from Holland, but, as we have seen, the Dutch say we had it here first; others say from Guernsey,

while there are others who maintain that the disease never appeared until new varieties were introduced in their collections. At first sight it certainly appears that the newer varieties are more addicted to the disease than the older ones. This may possibly, however, not be the case. When a grower brings new bulbs into his stock which was previously clean, he runs great risk of introducing eelworms. As very frequently it is the newer varieties that are added—and the bulbs may appear perfectly healthy—these new varieties are usually regarded as being more susceptible and so accounting for the spread of the trouble. If certain varieties prove to be immune we have a possible means of attacking the problem. WEBBER, ORTON, and others in America have endeavoured successfully to breed varieties of cowpea and other crops resistant to root-knot. It is perhaps a problem similar to that of rusts of wheat, where BIFFEN found that immunity is a recessive Mendelian character. Simple selection ought also to be practised; if in a field of Narcissus badly infected with *Tylenchus* certain of the plants remain outstandingly free, it would probably pay to begin propagating bulbs by offsets from these plants. The question of how such a common species as *Tylenchus devastatrix* suddenly became rampant amongst Narcissus bulbs is one of those problems which often face pathologists in general. Where did the variation occur, in Narcissus, in *Tylenchus*, or in both? Was it so sudden as most of us imagine?

There is much I should like to say regarding methods of cultivation, such as depth of planting, aspects, lifting annually, as against leaving the bulbs in the ground for two or more years, ripening, storing, forcing, etc., but the time at my disposal will not allow of it.

Many bulb-growers look upon the disease as "one of Nature's gifts," and are of the opinion that the bulbs will ultimately right themselves. The latter part of the statement opens up the whole question of health and disease in general. Suffice it to say that if the bulbs *are* left to right themselves, the bulb industry in Narcissus will soon cease to exist.

[The investigation of this Narcissus disease was undertaken jointly by the Royal Horticultural Society and the Imperial College of Science and Technology.]

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXXI.—EXPERIMENTS ON THE CONTROL OF EELWORM DISEASE OF NARCISSUS.

By J. K. RAMSBOTTOM.

Historical Review of Treatments previously Applied.

IN 1912–13 Mr. R. T. HEWITT carried out a series of experiments on the control of the Narcissus Disease, and, although his work was by no means completed, he recommended the soaking of affected bulbs in a cold solution of copper sulphate at a strength of from 5 per cent. to 7½ per cent. for a period of 17 hours. The effect of these solutions on the bulb, after soaking for the length of time stated, is recorded as being slightly injurious, and live eelworms were to be found in the centre of affected bulbs after treatment. A similar result was obtained by soaking the bulbs in a 10 per cent. solution of copper sulphate for 7 hours, while soaked in the same strength of solution for 24 hours no live eelworms were discovered in the treated bulbs. The bulbs, however, were badly injured by this strength of solution and therefore did not admit of this treatment being recommended. Mr. HEWITT also soaked bulbs in cold solutions of formalin 5 per cent., for 2 and 5 hours; formalin 10 per cent., for 1 and 2 hours; cresylic acid 2 per cent., for 1 and 2 hours; and paraffin for ½ and 1 hour; but in no case did the treatment kill the eelworms in the centre of the bulb.

The same writer conducted a few experiments with warm water at a temperature of 120° F., and records that all the eelworms are killed in bulbs soaked in water for 1, 2, and 6 hours at this temperature; the bulbs were killed even at the end of one hour by this process. Mr. J. W. BARR has also experimented with the warm-water treatment, and in the course of the discussion of my lecture (herewith published) he informed the audience that he had obtained excellent results by soaking infested bulbs in water at a temperature of 110° F. for a period of one hour.

Effect of Chemicals upon Tylenchus devastatrix.

Last August experiments were commenced with a view of finding some chemical method of controlling the eelworm attack on Narcissus bulbs. The first series of experiments was designed to test the effect of various chemical solutions and gases upon the eelworms by placing the worms in direct contact with the solution or gas. Where solutions were employed, the eelworms were placed in watch-glasses containing

the chemicals, while for gases Ward tubes and moist chambers were utilized. The results are recorded in Table I.

TABLE I.—THE EFFECT OF VARIOUS STRENGTHS OF CHEMICAL SOLUTIONS AND GASES UPON TYLENCHUS.

Solution.	Strength of Solution.	Time of Examination.	Results.
Potassium sulphate	1 per cent.	2 days	alive
Potassium sulphide	1 "	2 "	dead
Kainit	1 "	3 "	alive
Common salt	1 "	3 "	alive
Lime water	1 "	6 "	alive
Potassium permanganate	0·125 "	1 day	dead
Nicotine	1 "	2 days	alive
Formalin	commercial 40 per cent.	15 minutes	dead
Formalin	5 "	2 days	"
Carbolic acid	1 "	1 day	"
Ammonia 0·880 (vapour)	full strength	2 minutes	"
Benzole (vapour)	"	1 minute	"
Carbon-bisulphide (vapour)	"	"	"
Methylated spirit	"	"	"

It will be seen that the eelworms can withstand many solutions with no apparent ill effect, while other solutions act very injuriously towards them. Substances which are readily volatilized appear to be the most effective. It is interesting to note the effect of solutions of potassium sulphate and kainit, as dressings of these chemicals have been frequently recommended for keeping Tulip Root of Oats and Clover Sickness (diseases caused by the same pest) under control.

Effect of Treating Bulbs with various Chemical Solutions.

A long series of experiments was arranged in the autumn of last year, in the endeavour to find a palliative measure. Bulbs were soaked in a large number of chemical solutions for various lengths of time, healthy and diseased bulbs being treated in exactly the same manner. The confronting problem was to divide the bulbs into the respective classes—healthy and diseased. It is quite impossible, without cutting open the bulbs, to distinguish a slightly infected bulb from one which is perfectly healthy. The method adopted cannot be claimed to be infallible. Stocks of the varieties 'Emperor' and 'Sir Watkin,' as healthy as it was possible to secure, were obtained, samples of the bulbs being carefully examined for the presence or absence of eelworms. These stocks were classed as healthy. The diseased bulbs of the same varieties were obtained from stocks which had shown the characteristics of the disease during the growing season: these bulbs were then hand-sorted, and all those which were soft and had damaged bases were discarded as being incapable of growth. They were then "topped" in the manner explained on p. 56 in

order to avoid the great possibility of planting healthy bulbs, which are generally present in larger or smaller numbers in an infected stock. The healthy stocks were treated in the same manner to make certain that no diseased bulbs were present in the stock classed as healthy. By this means, as far as it was possible to ascertain, all bulbs classed as diseased were affected bulbs, while those placed under the heading of healthy were free from eelworm attack.

Twelve diseased bulbs and the same number of healthy ones were treated in each case, and planting was carried out in November 1916. In May 1917, the bulbs were lifted and the diseased ones microscopically examined to ascertain the effect of the solution on the eelworms.

Table II. presents the practical results of these tests, showing the duration of the time of soaking, the effect of the solution on the growth of the bulb (this being ascertained from the behaviour of soaked healthy bulbs), and the effect of the solution upon the eelworms. Eighteen hours were taken as the minimum period of soaking, as it was considered improbable that a solution could enter the bulb sufficiently to be injurious to the eelworms in less time. All the bulbs were treated in glass vessels and were planted directly after treatment.

TABLE II.—THE EFFECTS OF SOAKING HEALTHY AND DISEASED BULBS IN CHEMICAL SOLUTIONS.

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Creol . .	1 per cent.	18 hrs.	no injurious effect	live eelworms found
" . .	"	24 "	"	"
" . .	"	48 "	"	"
" . .	"	72 "	"	"
" . .	"	96 "	"	"
Creol . .	2 per cent.	18 "	"	"
" . .	"	24 "	"	"
" . .	"	48 "	"	"
" . .	"	72 "	very slightly damaged	"
" . .	"	96 "	"	"
Creol . .	4 per cent.	18 "	slightly damaged	"
" . .	"	24 "	damaged	"
" . .	"	48 "	badly damaged	"
" . .	"	72 "	"	"
" . .	"	96 "	"	"
Creol . .	6 per cent.	18 "	"	"
" . .	"	24 "	"	"
" . .	"	48 "	"	"
" . .	"	72 "	bulbs killed	"
" . .	"	96 "	"	"
Copper sulphate	5 per cent.	18 "	badly damaged	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Copper sulphate	7½ per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Copper sulphate	7½ per cent.	72 hrs.	badly damaged	live eelworms found
,,	,,	96 ,,	,,	,,
Copper sulphate	10 per cent.	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Formalin . .	5 per cent.	18 ,,	growth retarded and dwarfed	,,
,, . .	,,	24 ,,	,,	,,
,, . .	,,	48 ,,	,,	,,
,, . .	,,	72 ,,	damaged	,,
,, . .	,,	96 ,,	,,	,,
Formalin . .	10 per cent.	18 ,,	growth retarded and dwarfed	,,
,, . .	,,	24 ,,	,,	,,
,, . .	,,	48 ,,	damaged	,,
,, . .	,,	72 ,,	,,	,,
,, . .	,,	96 ,,	badly damaged	,,
Lead chromate	1 per cent.	18 ,,	no injurious effect	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Bentley's Poisonous Eelworm Destroyer	1 part in 80 of water	18 ,,	no injurious effect	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Bentley's Poisonous Eelworm Destroyer	1 part in 50 of water	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Bentley's Non-poisonous Eelworm Destroyer	1 part in 80 of water	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	,,	,,
,,	,,	96 ,,	,,	,,
Bentley's Non-poisonous Eelworm Destroyer	1 part in 50 of water	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	growth slightly retarded	,,
,,	,,	96 ,,	,,	,,
Carbolic acid .	1 per cent.	18 ,,	no injurious effect	,,
,, .	,,	24 ,,	,,	,,
,, .	,,	48 ,,	,,	,,
,, .	,,	72 ,,	very slightly damaged	,,
,, .	,,	96 ,,	damaged	,,
Carbolic acid .	2 per cent.	18 ,,	no injurious effect	,,
,, .	,,	24 ,,	,,	,,
,, .	,,	48 ,,	very slightly damaged	,,

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Carbolic acid .	2 per cent.	72 hrs.	damaged	live eelworms found
"	"	96 "	badly damaged	"
Potassium sulphide	¼ per cent.	18 "	no injurious effect	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium sulphide	½ per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium sulphide	1 per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	very slightly damaged	"
Potassium sulphide	3 per cent.	18 "	no injurious effect	"
"	"	24 "	"	"
"	"	48 "	very slightly damaged	"
"	"	72 "	damaged	"
"	"	96 "	badly damaged	"
Ammoniacal copper carbonate	—	18 "	no injurious effect	"
"	—	24 "	"	"
"	—	48 "	"	"
"	—	72 "	"	"
"	—	96 "	very slightly damaged	"
				"
Ammoniacal copper carbonate	double strength	18 "	no injurious effect	"
"	"	24 "	very slightly damaged	"
				"
"	"	48 "	"	"
"	"	72 "	damaged	"
"	"	96 "	badly damaged	"
Mercuric bichloride	¼ per cent.	18 "	no injurious effect	"
"	"	24 "	very slightly damaged	"
"	"	48 "	slightly damaged	"
"	"	72 "	damaged	"
"	"	96 "	badly damaged	"
Mercuric bichloride	½ per cent.	18 "	slightly damaged	"
"	"	24 "	damaged	"
"	"	48 "	"	"
"	"	72 "	badly damaged	"
"	"	96 "	"	"
Mercuric bichloride	1 per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Ammonia .	1 per cent.	18 "	no injurious effect	"

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Ammonia .	1 per cent.	24 hrs.	no injurious effect	live eelworms found
" . .	"	48 "	"	"
" . .	"	72 "	"	"
" . .	"	96 "	"	"
Ammonia .	2½ per cent.	18 "	growth slightly retarded	"
" . .	"	24 "	"	"
" . .	"	48 "	"	"
" . .	"	72 "	"	"
" . .	"	96 "	very slightly damaged	"
Ammonia .	5 per cent.	18 "	growth retarded	"
" . .	"	24 "	slightly damaged	"
" . .	"	48 "	"	"
" . .	"	72 "	damaged	"
" . .	"	96 "	"	"
Nicotine . .	1 per cent.	18 "	no injurious effect	"
" . .	"	24 "	"	"
" . .	"	48 "	"	"
" . .	"	72 "	"	"
" . .	"	96 "	"	"
Soft soap and sulphur	—	18 "	"	"
"	—	24 "	"	"
"	—	48 "	"	"
"	—	72 "	"	"
"	—	96 "	"	"
Potassium permanganate	0·033 p.c.	18 hrs.	no injurious effect: growth slightly accelerated	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium permanganate	0·125 p.c.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium permanganate	¼ per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium permanganate	½ per cent.	18 "	"	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Potassium hydrate	1 per cent.	18 "	no injurious effect	"
"	"	24 "	"	"
"	"	48 "	"	"
"	"	72 "	"	"
"	"	96 "	"	"
Hydrochloric acid	1 per cent.	18 "	"	"
"	"	24 "	very slightly damaged	"
"	"	48 "	"	"

	Strength of Solution.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
Hydrochloric acid	1 per cent.	72 hrs.	slightly damaged	live eelworms found
,,	,,	96 ,,	damaged	,,
Nitric acid	1 per cent.	18 ,,	no injurious effect	
,,	,,	24 ,,	very slightly damaged	,,
,,	,,	48 ,,	slightly damaged	,,
,,	,,	72 ,,	damaged	,,
,,	,,	96 ,,	,,	,,
Sulphuric acid	1 per cent.	18 ,,	,,	,,
,,	,,	24 ,,	,,	,,
,,	,,	48 ,,	badly damaged	,,
,,	,,	72 ,,	very badly damaged	,,
,,	,,	96 ,,	bulbs killed	,,
Chromic acid .	½ per cent.	18 ,,	growth dwarfed	,,
,, .	,,	24 ,,	,,	,,
,, .	,,	48 ,,	,,	,,
,, .	,,	72 ,,	slightly damaged	,,
,, .	,,	96 ,,	,,	,,
Potassium bichromate	1 per cent.	18 ,,	growth dwarfed	,,
,,	,,	24 ,,	very slightly damaged	,,
,,	,,	48 ,,	,,	,,
,,	,,	72 ,,	damaged	,,
,,	,,	96 ,,	badly damaged	,,

The experiments were duplicated in Lincolnshire and in all cases the results coincided with those obtained at Wisley.

To test the extent a solution was capable of penetrating the bulb, a 1 per cent. solution of eosin was employed in which the bulbs were soaked. On examining the bulbs at intervals of 18, 24, 48, 72, and 96 hours respectively it was observed that the solution had not even passed through the outer scales of the bulb, whereas the base had absorbed the liquid fairly readily. We are thus able to account for the damage caused to the healthy bulbs by such solutions as copper sulphate, mercuric bichloride, &c. The solution gained an entrance *via* the basal plate, the tissue of which had been so injured as to prevent healthy root growth. All the bulbs on which the solutions had acted injuriously had failed to produce sufficient roots and in some cases no roots were emitted. While it was possible to kill a healthy bulb by soaking in a chemical solution, live eelworms were to be found inside a diseased bulb treated in the same manner. The percentage of eelworms killed by the soaking was not considered, because untreated diseased bulbs always contain a number of dead eelworms. In treated diseased bulbs the question would arise as to how many of the dead eelworms were killed by the solution, and how many had died a natural death. The fact that live eelworms were found in a treated diseased bulb suffices to show that the treatment was inadequate.

In no case was soaking in cold solutions of chemicals of any avail, and no recommendation as to their use can be made.

The Effect of Treating Bulbs with Poisonous Gases.

Healthy and diseased bulbs were fumigated in air-tight chambers with toluol, carbon-bisulphide, formaldehyde (the gas being generated by the action of potassium permanganate on commercial formalin), hydrocyanic acid, naphthalene, and nicotine. The results are set forth in Table III.

TABLE III.—THE EFFECT OF FUMIGATING HEALTHY AND DISEASED BULBS.

Gas.	Length of Fumigation.	Effect on Growth of Healthy Bulbs.	Condition of Eelworms in Bulbs.
Naphthalene . .	1 day	no injurious effect	eelworms found alive
,, . .	2 days	,, ,,	,, ,, ,,
,, . .	4 ,,	,, ,,	,, ,, ,,
,, . .	7 ,,	,, ,,	,, ,, ,,
Formalin . . .	1 day	,, ,,	,, ,, ,,
,, . . .	2 days	,, ,,	,, ,, ,,
,, . . .	4 ,,	,, ,,	,, ,, ,,
,, . . .	7 ,,	,, ,,	,, ,, ,,
Toluol . . .	1 day	,, ,,	,, ,, ,,
,, . . .	2 days	,, ,,	,, ,, ,,
,, . . .	4 ,,	,, ,,	,, ,, ,,
,, . . .	7 ,,	,, ,,	,, ,, ,,
Carbon-bisulphide .	1 day	,, ,,	,, ,, ,,
,, .	2 days	,, ,,	,, ,, ,,
,, .	4 ,,	,, ,,	,, ,, ,,
,, .	7 ,,	,, ,,	,, ,, ,,
Nicotine . . .	1 day	,, ,,	,, ,, ,,
,, . . .	2 days	,, ,,	,, ,, ,,
,, . . .	4 ,,	,, ,,	,, ,, ,,
,, . . .	7 ,,	,, ,,	,, ,, ,,
Hydrocyanic acid .	1 day	,, ,,	,, ,, ,,
,, .	2 days	slightly damaged	,, ,, ,,
,, .	4 ,,	damaged	,, ,, ,,
,, .	7 ,,	badly damaged	,, ,, ,,

Fumigation appears to be of no use in killing the eelworm in affected bulbs, and it is probable that the bulbs offer the same resistance to the entrance of gases as they do to the admission of solutions.

Effect of Heat on Eelworms.

Experiments were conducted with the Reichert Thermal Stage by means of which apparatus it is possible to maintain a constant temperature during examination under the microscope. The eelworms, isolated from diseased bulbs, were placed in direct contact with the warm stage. The results are shown in Table IV. on page 73.

The ease with which eelworms could be killed by direct heat led the writer to believe that soaking the bulbs in warm water might lead to a possible means of control.

Reference has already been made to work carried out by Mr. HEWITT and Mr. BARR on the soaking of bulbs in warm water, and,

having regard to the result obtained by Mr. Hewitt that bulbs are killed by soaking for one hour at a temperature of 120° F., it was decided not to exceed this temperature. A preliminary experiment was conducted by soaking bulbs for one hour at a temperature of 110° F., and it was found that the eelworms in the centre of the bulbs were unaffected by this temperature.

The temperature of the centre of the bulb at the end of one hour was 9° F. below that of the water in which they were soaking. At

Table IV.—Reichert Thermal Stage Experiments.

Temperature.	Length of Time Eelworms Lived.
110–111° F.	45 minutes
119–120° F.	15 ,,
126–127° F.	11 ,,
128–129° F.	9 ,,
131–132° F.	9 ,,
135–136° F.	5 ,,

the end of four hours the centre of the bulb was the same temperature as the water.

It was decided to experiment with three ranges of temperature, viz. 110°–111° F., 114°–115° F., and 119°–120° F.; both healthy and diseased bulbs were given the same treatment and were allowed to remain soaking for 1, 2, and 4 hours. The temperature was regulated by means of a thermostat, and the vessels containing the bulbs were immersed in an outer bath of water. The results of these experiments are as follow:

Table V.—Effect of Soaking Bulbs in Warm Water.

Temperature of Water.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
110°–111° F.	1	no injurious effect	live eelworms found
110°–111° F.	2	very slightly retarded	an occasional eelworm found alive
110°–111° F.	4	slightly retarded	no eelworms found alive
114°–115° F.	1	badly damaged	live eelworms found
114°–115° F.	2	bulbs killed	no eelworms found alive
114°–115° F.	4	,,	,, ,,
119°–120° F.	1	,,	,, ,,
119°–120° F.	2	,,	,, ,,
119°–120° F.	4	,,	,, ,,

From these experiments it appears that a very high temperature is not necessary in order to kill the eelworms in affected bulbs. The bulbs, also, are readily damaged by heat or their growth retarded.

It appears that soaking the bulbs for a period of from 2 to 4 hours at a temperature of 110° F. affords the best method of controlling the eelworms in affected bulbs. The effect of soaking healthy bulbs in water at this temperature for a period of from 2 to 4 hours

showed itself in slight retardation of growth, and the flowers opened four or five days later than untreated healthy bulbs. The treated healthy bulbs did not flower quite so freely as the untreated healthy bulbs, although the bulbs were of the same variety and of the same grade.

The soaking of bulbs in water at a temperature of 110° F. for a period of 2 to 4 hours offers many difficulties. The temperature of the water must remain constant and each bulb should receive the same treatment. In cases where the soaking must be performed on a large scale it cannot be recommended to immerse the bulbs in full sacks in tanks containing warm water, as it is evident that the bulbs situated in the centre of the sack will not receive the same treatment as those situated near the sides. Experiments on the soaking of bulbs in water at a constant temperature are to be carried out this season on a fairly extensive scale, with the hope of finding a suitable apparatus for the purpose.

Soaking of Bulbs in Warm Solutions of Chemicals.

In addition to the warm-water soaking experiments, bulbs were also treated with warm solutions of chemicals. The results are recorded in Table VI.

TABLE VI.—EFFECT OF SOAKING BULBS IN WARM CHEMICAL SOLUTIONS.

	Strength of Solution.	Temperature.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
	p. cent.		hrs.		
Carbolic acid .	0·05	110°–111° F.	1	no injurious effect	live eelworms found
”	”	”	2	very slightly retarded	an occasional eelworm found alive
”	”	”	4	slightly retarded	no eelworms found alive
”	0·1	”	1	no injurious effect	live eelworms found
”	”	”	2	very slightly retarded	an occasional eel- found alive
”	”	”	4	slightly retarded	no eelworms found alive
Potassium sulphate	0·05	”	1	no injurious effect	live eelworms found
”	”	”	2	very slightly retarded	an occasional eelworm found alive
”	”	”	4	slightly retarded	no eelworms found alive
”	0·1	”	1	no injurious effect	live eelworms found
”	”	”	2	very slightly retarded	an occasional eelworm found alive
”	”	”	4	slightly retarded	no eelworms found alive
Potassium sulphide	0·05	”	1	no injurious effect	live eelworms found
”	”	”	2	very slightly retarded	an occasional eelworm found alive
”	”	”	4	slightly retarded	no eelworms found alive

	Strength of Solution.	Temperature.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
	p. cent.		hrs.		
Potassium sulphide	0·1	110°–111° F.	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
Potassium bichromate	0·05	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
"	0·1	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
otassium hydrate	0·05	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
"	0·1	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
otassium xanthogenate	0·05	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
"	0·1	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
Potassium permanganate	0·05	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
"	0·1	"	1	no injurious effect	live eelworms found
"	"	"	2	very slightly retarded	an occasional eelworm found alive
"	"	"	4	slightly retarded	no eelworms found alive
Carbolic acid	0·05	114°–115° F.	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"		"	4	"	"
"	0·1	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
Potassium sulphate	0·05	"	1	badly damaged	eelworms found alive

	Strength of Solution.	Temperature.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworm in Bulbs.
	p. cent.		hrs.		
Potassium sulphate	0·05	114°–115°F.	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
"	0·1	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
Potassium sulphide	0·05	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
"	0·1	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
Potassium bichromate	0·05	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
"	0·1	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
Potassium hydrate	0·05	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
"	0·1	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
Potassium xanthogenate	0·05	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
"	0·1	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
Potassium permanganate	0·05	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
"	0·01	"	1	badly damaged	eelworms found alive
"	"	"	2	bulbs killed	no eelworms found alive
"	"	"	4	"	"
Carbolic acid	0·05	119°–120° F.	1	"	"
"	"	"	2	"	"
"	"	"	4	"	"

	Strength of Solution.	Temperature.	Period of Soaking.	Effect on Growth of Healthy Bulb.	Condition of Eelworms in Bulbs.
	p. cent.		hrs.		
bolic acid	0·1	119°–120° F.	1	bulbs killed	no eelworms found alive
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
assium ılphate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
assium ulphide	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
assium ichromate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
tassium anthogenate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
tassium ıydrate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
tassium ›ermanganate	0·05	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,
,,	0·1	,,	1	,,	,,
,,	,,	,,	2	,,	,,
,,	,,	,,	4	,,	,,

The results obtained by soaking bulbs in warm solutions of hemicals appear to offer no advantage over soaking in warm water. t may, however, prove advisable to use a warm weak solution of arbolic acid as a soaking medium, as by this means the bulbs may ecome sufficiently disinfected to deter further eelworm attack.

Effects of Cold.

Many growers were of the opinion that the severe winter emperatures experienced this year would aid in reducing the eel-

worms. Diseased bulbs were left on the surface of the soil throughout the whole of the winter. The thermometer at Wisley registered as much as 37° of frost. The bulbs on being brought into the laboratory were examined and eelworms in an active state of life were found.

Planted diseased bulbs were lifted after being subjected to alternate freezing and thawing, and live eelworms were present in the bulbs.

Conclusion.

The preventive method which promises best results is that of soaking the bulbs for a period of from 2 to 4 hours in water at a constant temperature of 110° F., and, providing a suitable apparatus be found so that the bulbs may be given correct treatment, it will afford an economical means of combating the disease.

At the same time it must here be pointed out that this soaking will not prevent attack by eelworms present in the soil.

Other experiments are on foot this autumn, and the treatment of infected ground, and susceptibility of crops to attack, are phases of the subject which are under experiment.

A YEAR IN A GARDEN ON THE NORTH-WEST COAST OF ROSS-SHIRE.*

By OSGOOD MACKENZIE, F.R.H.S.

MARCH.

I RETURNED from the South on March 3, to find all my treasures wonderfully well preserved from the effects of winter. January, I was told, was something awful up here in the way of hurricanes and floods, but there was next to no frost, so my tenderest exotics did not mind the weather in their snug corners. The only things I found dead were a small, and to me unknown, *Eucalyptus* of doubtful hardiness, which someone had sent me on trial, and a *Sutherlandia* from South Africa, which bloomed well in the autumn (something in the way of a *Clianthus*), but gave up before the winter really started.

I also lost, towards the spring, two of those new bright-coloured Leptospermums (*Nicholli* and *Chapmanii*), which, I believe, I killed by over-care and coddling, having covered them (as it was their first winter) with night-caps of thin scrim; but my experience is that covering does not always answer; in fact, more often than not, it oes harm, as I found when I first started growing Eucalypti. Thus have got off, so far, uncommonly well, unless April punishes me), r perhaps even May, by a sharp frost, which is particularly hurtful, specially to the soft young shoots of the earlier-starting Rhododenrons.

My winter-flowering Rhododendrons did great things as usual ith us, and their beauty was such that people in London would hardly redit they could possibly have been grown out of doors in the North, nd the masses of *R. Nobleanum* and *R. praecox*, and the branches of ndromedas and Hamamelis posted to us, made us all but forget t was winter! On March 3 I found the dear old *Narcissus scoticus* nd *N. pallidus praecox*, and also *N. minimus*, expanded in considerble quantity; in fact, we always reckon on having them out here n February; and *N. cyclamineus* is never far behind them. The last s so dainty, and does so well, and spreads by seeding itself freely, s many of the Narcissi do here. I also found *Rhododendron Shiltoni* out on my arrival, and it is really almost exactly like one of its parents, the beautiful *R. Thomsoni*, only five to six weeks earlier, which I am told is due to its other parent being *R. barbatum*. Curiously, I have had no luck with the latter so far. It is one of the very few Rhododendrons which have rather gone against me.

R. ciliatum also started expanding in the end of February, and

* For a description of the garden and its situation see "Gardening in the Western Highlands," JOURNAL R.H.S. (1908), xxxiv. p. 47.

what a gem it is, as it never fails, though it might not be quite hardy in a very severe climate.

The two newer varieties of *R. Nobleanum* (viz. *venustum* and *coccineum*) are so well worth growing, coming in just when the original kind is about over, and they are quite distinct, for, instead of being red, the one is a beautiful light rose, and the other a deep crimson. I have also a Continental variety, which has for some years been much used in the South for forcing, called 'Silberaad's Early,' starting pale rose and finishing up pure white, and it is quite successful, and very early out of doors here. I have also an *arboreum* full of bloom, whose name, alas, if it had any, I have lost, and the first of its blooms expanded about the 25th of March, and it has the rather unusual, but very useful, habit of flowering in the centre of the bush, instead of, in the ordinary way, on the outside tips, and thus it is protected from damage from frost or hail showers. Its flowers are a glorious crimson, in rosettes surrounded by the most beautiful long leaves; so handsome are its leaves that it would be almost worth growing for its foliage alone.

I came upon a new treasure in the way of a winter-flowerer, which to me gives it so much more value—viz. *R. mucronulatum.* It is, I am told, a southern and glorified form of *R. dauricum*, and I was much struck with it when I came across it blooming in the open at Kew in January, and certainly it was most striking; and, though it is not easily got, I have managed to procure two plants of it!

I have also got two plants of *R. moupinense*, which is low-growing and white-flowered, and blooms also in mid-winter.

April.

What a miserable month April has been! But, as there was no frost down here at sea-level, my plants flourished.

I really thought it was never going to change for the better, and even one or two faint, half-hearted calls from the cuckoo brought no relief, till one day, about the 26th, a hoopoe suddenly appeared here, bringing fine weather with it from somewhere (probably Algeria or Egypt), and since then the weather of the remaining days of April has been quite perfect. Flowering bulbs, which do extra well with me in April, and which I seldom see elsewhere, except on a very small scale, are the Erythroniums or American dog-tooth violets. Here they come up from self-sown seed in masses, even in the gravel walks, and are ivory white, bright yellow, crimson, mauve, and pink; they never fail, and are such a joy! I measured one to-day over eighteen inches high, with six big white blooms on the one stalk, and so large as to remind one of a miniature lily. And so are the big patches of the pale-blue *Anemone nemorosa Robinsoniana*, and another called 'Blue Bonnets,' which spread like weeds.

April produced so many gorgeous Rhododendrons here, but only one of the hybrids (which we usually call Waterer's) expanded in

April. Their seasons are May and June and into July, but even the very best of them hardly come up to the choicest of the newer species. I have had, for the last ten days or fortnight, some perfect marvels in the way of big, eight to nine feet high, *R. Thomsonii* bushes smothered from top to bottom with their dazzling blooms, and among them, as a contrast, a nice bush of *R. Falconeri*, with twenty-one perfect white blossoms, so tropical-looking, as if they could never be grown but under glass, and each truss about as big as a child's head. Also a tall *R. rubiginosum*, more like a spotted fancy Pelargonium out of a greenhouse—and who could believe it to be even a connexion of those grand varieties of *R. arboreum* which have bloomed all through April?—and especially one whose tally calls it a *Shilsoni* cross, but which is, I think, 'Gill's Triumph,' which really, without exaggerating, is, I should say, the most perfect example of a Rhododendron, both as regards shape, texture, and colour, I have ever seen. One of the most fascinating things in the way of Rhododendrons which April produced were some sprays of *R. campanulatum* brought in by my daughter, with large bright mauve, somewhat bell-shaped blooms; but the foliage was its strong point, the upper sides of its leaves being a glossy dark green, while the under sides were as if composed of dull orange velvet, and the contrasts between the mauve and the green and the old gold were something not to be forgotten! The pale-yellow Rhododendrons have also been striking towards the end of this month—viz. *R. campylocarpum*, *R. ambiguum*, and *R. triflorum*. The yellows, all told (if one does not include the deciduous varieties usually called Azaleas), are but a comparatively small group, but yellow, not being among the ordinary evergreen rhododendron colours, appeals to me, especially when contrasted with the deep plum-coloured blooms of *R. niveum* and the all but blue *R. Augustini*, all of which blossomed here in April.

In spite of these sad times, and in spite of great difficulties in the way of transport, I have got a nice lot of new things from my favourite nurseries in Ireland and Cornwall, which, if I live a few more years, I shall have such interest in watching; and among other things I have succeeded in wintering some plants of the glorious blue flowering plant *Myosotidium nobile* from the Chatham Isles, and am hoping to bloom it some day, if not this summer.

MAY.

May and June are perhaps the most difficult months to tackle in attempting to describe even a few of the best and most striking of the vast multitude of trees and shrubs which blossom during those two months. Quite early in the month I had the following beautiful and more or less uncommon shrubs just smothered in bloom, viz. *Ceanothus rigidus*, *Magnolia stellata*, *Drimys aromatica*, *Azara Gilliesii*, *Enkianthus campanulatus*, and *Osmanthus Delavayi*. The Azara is a healthy big bush of ten feet high, reminding me just a very little of

the Mimosas, which, sad to say, I have grown but have failed to bloom so far. The Azara blooms rather resemble the Mimosa in shape and in the manner in which they are attached to the branches, only they are of a full orange instead of a pale yellow; it is, indeed, a noble shrub, and so very superior to *A. microphylla*, which is better known.

Drimys aromatica is most charming with its crimson flower-stalks, and quite unlike any other flowering shrub I know, except that it bears a slight resemblance to its cousin, *D. Winteri*, which flowers here in July. Curiously, the homes of these near connexions are very far apart—viz. Tasmania and Chile! The others of the above-named hail from China, Japan, and California; and they all seem equally to approve of our West Coast climate and thrive to perfection.

Among May herbaceous plants for naturalizing in grass or in semi-wild places, let me commend the Trilliums and the white Fritillarias; neither of these increases or spreads itself quite to the extent, for instance, of some of the Narcissi, the various Wood Anemones, or the Snowdrops, but they do very well indeed here, and come up year after year and deserve every encouragement; and so do the giant white campanulate Scillas, and, in fact, all the tall Squills, whether blue, pink, or white, which come up so well under trees.

Since jotting down these notes ten days have passed, and we are getting towards the end of the month. A whole fresh lot of Rhododendrons have expanded, and I hardly know which to extol the most! Perhaps 'Loder's White' would have been given first prize by some judges, had it been possible to have the whole lot exhibited at a flower show; the bush was so perfect, and it almost gave one the idea of something which was not quite of this world, so ethereal was its loveliness. But others of this more modern type come very near it in excellence, such as 'Pink Pearl,' *Gauntletii*, 'George Hardy,' and *Manglesii*, &c., and I have an idea that they all have *Aucklandi* blood in them.

I have not yet succeeded in getting very good trusses of bloom off my *Aucklandii*, such as are produced in Cornwall, though some of the individual flowers were perfect, and I had only just enough of them this year to make me long for more, which will, no doubt, come in time, and all that is wanted is just a little patience. It certainly is the queen of the Rhododendron species.

I can thoroughly recommend the Southern United States Azalea, *Rhododendron Vaseyi*, it is so hardy, and, being deciduous, does not mind what the winter tempests or spring frosts are like, which is different from some of the evergreen Rhododendrons, with their long strap-like leaves, which get torn by the gales, so that they require very sheltered situations. *R. Vaseyi* varies in tint from white to pink.

Still more beautiful is one of the newer Rhododendrons from China—viz. *R. yunnanense*. My former description of *R. rubiginosum* might, in a way, apply also to it, in that its bloom reminds me a little of some very dainty fancy Pelargonium. It is a gem of the first water!

I need perhaps hardly mention *R. cinnabarinum*, and its sister *R. Roylei*, as they are well known, but they are both extra charming, and the latter is in shape and also in colour quite apart from other Rhododendrons, its blooms being of a weird buff and orange colour.

I think one is apt perhaps to tire a little of those perfectly symmetrical cones of bloom, such as are thought perfection in the hybrids from a florist's point of view; and, if so, I possess a Rhododendron of a very different style, gifted to me by M. DE VILMORIN, of Paris—viz. the new and as yet uncommon species from China, *R. chartophyllum*. It is snow-white, and has this peculiarity, and, I think, great merit about it, that the delicate pale-green young growths push up through the centres of the loose bunches of inflorescence, and this takes away all stiffness, and makes the trusses of bloom, from a little distance, look as if they were a most tasteful combination of green and white. I do not know any other Rhododendron with this quite peculiar and charming habit, and it is such a good doer here.

I will only mention one more plant—viz. the double *Azalea narcissiflora*. Why it has been given this ridiculous name I cannot imagine, as no part of it resembles a Narcissus in the slightest degree; but it is most telling, brilliant, and floriferous, in colour bright mauvy pink.

Against a south wall I have a Clianthus in full flower just now (I think it is better known as the lobster-claw plant). *Habrothamnus elegans* and *Teucrium fruticans* have also done well against the same wall, with slight protection, and are flowering profusely.

JUNE.

I rather meant to have started with the Crinodendrons and Embothriums, but feel impelled, first of all, to say something about a favourite tree of mine, the New Zealand *Aristotelia racemosa*. I have had it many years—indeed, I now quite forget how, or from whom, I got it originally; but it has always thriven here, and yesterday (the 1st of June), when admiring it from a little distance, it appeared to my old eyes as if it had a pink tinge all over it, and, lo and behold, when I reached it, it was a mass of inflorescence. Though the individual flowers were rather insignificant, they interested me immensely, as it never showed a sign of flowering before. This Aristotelia has every appearance of being deciduous, whereas it keeps on its large soft pale-green leaves throughout hardest frosts and snows, and it would be quite worth having a group of it near a home to cheat one into the belief in winter that it was June instead of January. I hear its wood is much used in New Zealand for making gunpowder.

My *Crinodendron Hookerianum* (or, to give it its correct name, *Tricuspidaria lanceolata*) I need not describe minutely, as I have done so more than once before. It is a grand shrub, and I am flattered by having been told that my big one is the finest in the British Isles; this is, however, I fancy, a fable, as I feel sure there

must be larger specimens in the South of Ireland, where the soil and climate are much better than ours up here. However, I will give its dimensions—viz. height 19 feet, and circumference about 45 feet, which is not bad for the northern Highlands! As to the blooms on it, it never before had quite so many, and it would be all but an impossibility to count them, as its branches are simply weighted down with the thousands of its crimson blooms.

Its white-bloomed half-sister (*T. dependens*), which is said by some to be hardier than *lanceolata*, I find rather tender. I have seen it in bloom under glass in the South, and thought it very inferior in every way to the red one.

And now for the pride of my heart, the Chilean Fire-bush! I flatter myself that there are very few, if any, other good specimens of the *Embothrium coccineum* in Scotland besides my own; at least, I have not come across them or heard of them. If anyone else, in the north, south, east, or west of the country, does grow them well, it would interest me very much indeed to hear how they managed to succeed with them. I find few trees easier to grow, and, by way of describing them, I may say that their branches are closely packed with what look rather like the most brilliant light-scarlet honeysuckle blooms. Very few, if any, trees that can be grown in Britain can in the least compare with the Embothriums, as I have seen them in Cornwall, 30 feet high; and, when the sun shines on them, it is a sight to rejoice the heart of any botanist.

I often wonder how little is known by the general public about that hardy June-flowering bulb, *Habranthus pratensis*, and how seldom it is grown. I have a small clump of it with three fine flowering stalks, the blooms just expanding, and I mean to go in for it on a larger scale. It is just a kind of Amaryllis, and as lavish with its glittering scarlet as the Fire-bush. I know a place in Norfolk where they grow it on quite a large scale, but the public are somewhat slow in taking up a new thing, though, in truth, this is far from new. It is warranted hardy!

I am almost shy of starting on Rhododendrons again, but, in case any of my readers might think of ordering a few of the newer hybrids, I would strongly recommend the following eight, viz.:—'Alice,' 'F. B. Hayes,' 'Doncaster,' 'Corona,' 'Mrs. Stirling,' 'Lady Grey Egerton,' 'Bagshot Ruby,' 'Loder's White'; and of Rhododendron species, *R. Ungerni* is very good, with such beautiful foliage, and such grand trusses of lovely soft pink, and *R. sutchuenense* is a real treasure also.

Before finishing with the June flowers, I cannot help just mentioning the great pleasure the giant flowers the lilies of the valley gave us this year. So often, when a wild flower is enlarged and improved by cultivation, it loses its original charm in some way, and often becomes more delicate and difficult to grow, but it is not so with the giant (Fortin's) Convallaria, as its beauty and fragrance seem only enhanced, and in the way of growth and spreading it almost equals the famous, or rather infamous, Bishop's weed!

July.

As the rose is called the queen of flowers, I think I will start this month with a description of the newer Chinese wild Roses. Some of them have given us such pleasure this summer. *Rosa Moyesii* is something quite out of the common, and its foliage and fruit are about as striking as its lovely blooms, and so are *R. Wilmottiana*, *R. Hugonis*, &c., and anyone keen on flowers should get them without further delay.

Perhaps my most striking July shrubs are *Abutilon vitifolium*, *Solanum crispum*, and *Olearia macrodonta*. I need not enlarge upon the very great merits of *Abutilon vitifolium* as a most beautiful flowering small tree. *Solanum crispum* will also grow into what might almost be called a tree. There is a variety of it called *autumnale*, which I got from Glasnevin Botanic Gardens, which is later, and perhaps a better thing, than the early summer flowering one; and its masses of lavender blooms (though rather reminding one of potato blossom) are, I think, most telling and attractive. It is such an easy thing to grow anywhere, and its flowering season lasts such a long time, which is a great merit in a flowering shrub.

The third most striking July tree (if I may so call it) is certainly *Olearia macrodonta*. I have three, which are already 15 feet high, and wide in proportion. To convince my readers how they show up when in bloom, I may mention that one of mine is now a most striking object from the opposite side of Loch Ewe, at a distance of about one and a half mile. Like my big Crinodendron, my Olearias are the largest specimens I have ever met with anywhere, and I know of no other flowering tree of such snowy whiteness, except perhaps the Exochordas, which I forgot to mention in my June notes, and for the benefit of my readers I should perhaps explain that I had never been able to bloom the beautiful pearl bushes till I got a tip from a friend to try a variety called *Exochorda macrantha*, which was a real success this year, though only planted two years ago.

To show how happy the New Zealand holly (*Olearia macrodonta*) is here, I should perhaps also mention that it has never failed to bloom most profusely every year, and that plenty of its self-sown seedlings come up all over the place.

In close proximity to my Olearias I have just now three other very striking shrubs in full bloom, viz.: *Rhododendron Keysii* from Bhotan, *Buddleia Colvillei* from Sikkim, and *Azalea calendulacea* from America. No one seeing *Rhododendron Keysii* for the first time (unless very well up in shrubs) would ever imagine it could possibly be a Rhododendron, its blooms being more like that scarlet and yellow greenhouse plant, the *Correa*. The Buddleia blooms are also quite different from, and very superior to, the ordinary class of Buddleias, being more like inverted foxgloves; it is perfectly hardy here, but I am not sure if it would stand a bad winter in inland or East Coast places in Scotland.

An especial favourite of mine is *Philesia buxifolia*, and it is flowering rather nicely in a small way just now, but I find it a very slow grower, and do not get on with it as I would wish to. I saw it doing so much better at Abbotsbury in Dorsetshire. It is quite unique, and I believe it only has one other relative in this wide world which at all resembles it—viz. the *Lapageria rosea*, but the former is a dwarf shrub, whereas the latter is a tall climber, though the blooms are all but identical in form and colour.

I will finish July with *Grevillea sulphurea*, a rather striking Australian plant, with queer yellow flowers, differently shaped from any I have ever come across. It does quite well here, and I had a red one also, *Grevillea rosmarinifolia*, but I fear I killed it by shifting it.

August.

This being a late year, it is the month for most of the Veronicas, Philadelphuses, and Spiraeas, though some of them were in bloom at the end of July.

In a hard winter all Veronicas are not quite hardy here, but most of them are, and they make a fine and lasting show. I would not part with my great bushes of the sweet-smelling white *Veronica salicifolia*, and the blue *Veronica Andersoni*, or the deep-claret one (whose name I have lost), for anything, and knowing that is, I suppose, the reason for their trying to please me by seeding themselves in thousands; but when *salicifolia* comes up like mustard and cress in my gravel walks, then I cry, Enough!

How I wonder that people stick to the one old original Philadelphus (which it pleases them to call *Syringa*), and which one sees everywhere, while there are a dozen or twenty so very much more charming varieties (mostly raised by Lemoine of Nancy) which can be got nowadays at any good nursery. I know of no shrubs that perfume the whole air, even for a considerable distance, like some of these newer Philadelphus, and I fancy their exquisite perfume comes from their having been crossed with the small-flowered and lower-growing *Philadelphus microphyllus*. I have a lot of varieties; Philadelphus 'Virginal' is grand, and some big double ones almost like Guelder Roses are most striking.

Lemoine has also done such wonders of late years for the Lilacs, the Deutzias, and the Diervillas, which he has turned into something quite superior and quite different from the original kinds on which he started. But these are not my grandest August shrubs by any means, and I should perhaps have begun with the Buddleias, the Plagianthus, and the Desfontaineas. *Buddleia magnifica*, *B. superba*, and *B. Veitchiana* are quite a different lot from *B. Colvillei* or *B. globosa*, and most people say they should be pruned in close every year, but I have left some to grow into trees, just as they like, and where there is room I think they look magnificent. I have one big one just now which could fairly compete with my famous

Crinodendrons and Embothriums. Their one fault is that they last so short a time in bloom. A most choice and charming flowering tree is the New Zealand ***Plagianthus Lyalli***, and it is a splendid doer here, and when in bloom in August reminds one of the cherry blossom in May, only its growth and foliage are more artistic than that of the cherry; it is a real treasure for the arboretum. But for brilliant colour in August commend me to the Desfontaineas, and when one has a Desfontainea bush, as I have here, all scarlet and orange, under a Plagianthus in full flower, the combination is perfection. Desfontaineas grow only too well here, and, as with my Japanese maples, I have to use the saw and the knife to them to keep them within bounds.

Among the many things I wonder at, one is that people never seem to have arrived at the fact that the Agapanthus is just an extra good hardy perennial on this West Coast; and what a show they make in the gardens, as well as out in the shrubberies here, with their heads of blue, and some of them white also! I see my clumps are sending up as many as twelve and thirteen flowering stalks, and they have one great merit, that no amount of wind and rain affects them adversely, and they stand all the frost we get, right out in the open, without any kind of protection.

The brilliant Antholizas, the lovely white Watsonias, and the tall *Dierama pulcherrimum* are equally grand South African plants that love our climate; and what a sight the latter (which are often called wand-flowers) were last year, waving their graceful heads about at Monreith in Galloway and Arduaine in Argyll, and they look so well here and elsewhere overhanging a pond or burn!

I ought to have mentioned in my July notes the Leptospermums. They are about the latest things out in flowering shrubs, and are really very fascinating. Some new plants which I got this year flowered profusely, and we all lost our hearts to them, as they are quite different from anything else I know. I fancy they are just sports from the common manuka (*Leptospermum scoparium*), which, I am told, is as plentiful in New Zealand as heather is in Scotland. The following three varieties are the new brilliantly coloured ones—viz. *Boscawenii*, *Chapmanii*, and *Nichollii*. *L. lanigerum* is also a fine shrub, and does first-rate here.

SEPTEMBER.

There can be no doubt that the *Eucryphia* is the very best flowering shrub in September. I have only just started *Eucryphia cordifolia*, and so cannot say anything about it, but *Eucryphia pinnatifolia* I have grown for years, and my examples of it are already quite among my show shrubs, and look as if they could very soon be described as trees. I do not know any shrub that I can more highly recommend to everyone as being so thoroughly hardy and such a good doer, and never sick or sorry whatever the seasons may be like. They

are most floriferous, and their bloom is so lovely. I think I described it once before as being a little like sprays of the white dog-rose, with this difference, that there is a faint greenish tinge at the base of the petals; in fact, the centre of the flower is very pale green, which shows up more forcibly the lovely and prominent anthers which, instead of being yellow as in the dog-rose, are crimson. The Eucryphia has two other merits over our native dog-rose—viz. that its foliage is evergreen and that as a cut flower it lasts extra well in water. Some people liken it to a white St. John's Wort.

September is sometimes a good time here for the Cistuses, though usually August is their best time. They only do fairly well with me, and I grow *Cistus purpureus*, crimson with deep-red blotches; *C. ladaniferus*, white with the dark-chocolate blotch; and *C. crispus*, bright pink all over; but they do better, I think, for instance, on the coast of Norfolk on chalk, and with a hotter sun, and there they can almost compete with Rhododendrons in the size of their bushes. I believe if I planted them on lime rubbish in the hottest exposure I could find, instead of in my peaty stuff (which suits most things so well), and planted them also where there are no trees to shade them, they would do better.

My Romneyas (Californian poppies) have done really grandly this year. They did not thrive quite so well against a hot terrace wall in my kitchen-garden, but in one of my shrubberies they have been a real success, though not equal to some I saw at Craignish in Argyll, and I mean to try the new *Romneya trichocalyx*, which is said to be a still better doer. My Mitrarias were late this year, and did not flower as much as usual, though even a few of their vivid scarlet blossoms, in shape like a bishop's mitre, are always a joy to look at. I am told in some famous garden in the Mull of Galloway they grow hedges of Mitraria, but I have not yet reached that pitch of perfection, and meanwhile have to content myself with a hedge of *Phygelius capensis*, which, I think, is rather uncommon, and of which I am not a little proud, and I can thoroughly recommend it for the West Coast as a hedge plant. It is now full of its long crimson spikes, reminding one almost of stiff, stick-up Pentstemons, and will carry on all through October and November. It does not seem very well known in Scotland; why, I cannot think. The first time I saw it was covering the gable of a house on the Lago Maggiore, and I little thought then I could grow it equally well here!

I grow the tall St. John's Wort, *Hypericum Hookerianum*, in clumps among my shrubs, and with the help of the Spanish broom they give a golden glitter in September to places which might otherwise be getting rather colourless.

And now I will finish up September with a short description of what I consider to be a beautiful subject for a shrubbery, though more like an herbaceous plant than a shrub. Its name is *Coriaria terminalis*, and like many other Sikkim plants it thrives here. Its beauty consists in its fruit, and not in its flowers. Let those who

do not know it imagine spikes nine and ten inches long, encrusted with its fruit all round, like maize on its cob, only not nearly so stiff and clumsy as Indian corn, and the fruits are set close together on the spike, and are very like big, transparent white currants. It spreads here, and is thoroughly at home, and everyone who sees it falls in love with it.

OCTOBER.

We have had such a spell of terrible weather during the middle of this month that only flowering shrubs such as the Hydrangeas and Myrtles could have stood it. The black-stemmed Hydrangeas with the very blue flowers have been, if possible, better than ever; and as to the paniculate Hydrangeas, they are among the very choicest blooming shrubs ever discovered; no equinoctial hurricanes or floods (even if accompanied by sleet and hail) seem capable of injuring them. I find (as with the Buddleias) there are two ways of growing them—*i.e.* either in a border with rich soil and close pruning in annually, under which system they remain low but produce huge heads of bloom, or, on the other hand, to grow them more or less naturally in the shelter of woods, allowing them to spread and shoot up tall, with next to no pruning, and though the individual blooms may be somewhat smaller, they make a most delightful show all through October and most of November. They have just one drawback, for which we have not yet found a remedy—viz. their inability to last long fresh in water when cut and brought into the house.

The next plants I find best for blooming in October are those well-known, lovely lilies, *Lilium auratum* and *L. speciosum*. They generally do so well in peaty Rhododendron and Azalea beds, and some of the former reached the height of between seven and eight feet this year. A big vase of these lilies in a room in October cannot be beaten for perfection of beauty by any other flowers grown during the whole rest of the year—for, besides their glorious colours of white and gold, pink and deep crimson, their perfume is so delicious.

Abelia grandiflora is a nice pink October-flowering shrub, and does quite well here, but I saw it flowering much more profusely against a hot terrace-wall in Argyllshire. *Diplacus glutinosus* is now producing its coppery orange blooms, which so exactly resemble the ordinary herbaceous monkey-plant. It is, in fact, just a Californian tree *Mimulus*, but I cannot boast of its being really hardy, as, like a lovely South African *Epacris*, which I sometimes bloom in a small way, it requires a little protection, which usually consists of a hand-glass with half its panes missing!

Next to my Hydrangeas, my most striking big shrubs blooming this month are undoubtedly the Myrtles. I have two kinds—viz. the old-fashioned very fragrant European one, usually grown indoors in pots in the colder districts, but which blooms so late here, even on a south wall, that in a cold year like this it can hardly be said to flower at all; and a vigorous, very hardy kind from Chile, which I got off

the big myrtle of Craignish, and which never fails to be white with blossom all September, October, November, and even December. Some would call it a *Eugenia*, but its most up-to-date name is, I think, *Myrtus Luma*. It is a really grand and most satisfactory shrub.

The autumn-flowering Cyclamens (viz. *Cyclamen hederaefolium*) are flowering rather nicely just now, as their cousins, *C. europaeum*, did in July; but I have never had what I could call real success here with Cyclamens, and they are among that small list of plants which I persevere with, but which never seem quite happy, and so different from what I have seen in Cornwall, where their leaves cover the ground under giant *Pinus insignis* trees, just like ivy. I am convinced it is the soil and not the climate which partially offends them, and perhaps if I give them soil which has no peat, and plenty of old lime rubbish, they may do better. I noticed in Palestine that *Cyclamen persicum* throve to perfection in holes and chinks in pure limestone rocks, and what a sight they were in Galilee in early March!

Just to show what a cold late season this has been, my *Clerodendron trichotomum* has all but failed to flower, though further south I saw it doing better; and *Eryngium pandanifolium*, with which I will finish up October, is also behindhand. The latter is certainly a very striking object for a lawn or shrubbery. It comes from far, far away—viz. the Chatham Islands, 500 miles east of New Zealand—and in an ordinary year with me it just manages (more or less) to perfect its steely-blue sea-thistly flowers towards the very end of October. What a magnificent clump I saw of it at Craignish lately, with a big sheaf of blooming stalks ten feet high!—and I can thoroughly recommend it for a sub-tropical nook, among Phormiums, Cordylines, Eucalypti, Paulownias, Mimosas, Abutilons, Chamaerops palms, tree-ferns, and even *Musa Basjoo* (the hardy banana), all of which can be grown without protection on this West Coast. The only one of the lot which I have not got is the Musa, and I am getting it.

NOVEMBER.

No frost as yet (November 25) at sea-level, though there has been a degree or two inland, and consequently we can still, in November, produce specimens of most of the well-known flowers grown in British gardens, Dahlias, Begonias, Gladioli, Roses, and Mignonette, mixed up with some Primroses, Polyanthuses, and Violets, which are evidently mistaking November for February or March! How thankful I am that I live in a climate where the Fuchsias are at their best in November, and where the tall tropical-looking Mexican Brugmansias, with their handsome long pendent scarlet tubes, make one believe it is still hot weather, whereas it is really winter, though the thermometer goes up sometimes to 50 and even one day to 55; and this, together with the great blessing of having usually an early spring

here, makes the much-dreaded winters pass so easily and quickly; and how different it must be where in many Scottish and English homes the gardens are dreary deserts, the effect of some cruel frost in September!

If it were not for the abundance of other flowers, the second blooming of the big bushes of *Desfontainea spinosa* (which is now on) would be warmly applauded, but when the terrace walls are still orange and red with *Tropaeolum tuberosum* and *Phygelius capensis*, and blue with the most perfect Hydrangeas and Ceanothus, the Desfontaineas and *Myrtus Luma* in the shrubberies hardly get the admiration they so justly deserve; and then there is the autumn leaf-colouring, which is really almost more brilliant than even the flowers themselves. It has not been by any means a good season for autumn tints.

Whole woods of the native birches lost their leaves very early, falling in showers while still all but green; and the rowans, Norway maples, geans, and aspens did the very same. But there were some notable exceptions among the exotics, such as a nice big *Acer nikoense*, which turned a rather unusual lovely salmon tint; and *Disanthus cercidifolia*, the Gaylussacias, *Enkianthus japonicus*, and the Eucryphias were marvellously brilliant, and so were most of the Japanese maples, but their beauty was so short-lived, and some that used to turn vermilion only turned a reddish orange, owing, I fancy, to want of sun, and perhaps also want of slight frosts at night and there being far too much rain.

Although the shrubberies are now not so bright as they were, they are to me quite as interesting as ever. I am so proud of my comparatively small tree-ferns (the New Zealand Dicksonias), and this season seems to have suited them well. Of course they are a bit delicate, but they can generally be kept going by tying their own fronds in a bunch over their heads to keep the frost and snow from spoiling their crowns from which the coming year's fronds will start, and which seem to be their tender point. I cannot boast of my fronds being quite six feet long, though I saw some at Trewidden in Cornwall which, I think, were nearer twenty-five feet, grown at the bottom of deep holes, said to have been dug by the ancient Phœnicians when burrowing for tin.

I have several interesting new plants which are in course of being tried to test their hardiness here—viz. the *Guevina*, which has so far proved itself quite hardy at Arduaine in Argyllshire for the last two or three winters, and *Anopteris glandulosa*, which struck me as being the most charming new plant that I saw in all Cornwall two years ago, and I am interested also in several new Eucalypti, which promise well. One of them is *Eucalyptus Mölleri* from Tasmania, recommended to me by Professor Henry, of Dublin, and the other is *E. alpina* They are about as unlike each other as it is possible for trees of one tribe to be, the one with rather unusually big leaves, and the other just the contrary with very small leaves.

I am now growing about nine species of gum trees (as the Australians câll them), and so far they are proving themselves quite hardy and satisfactory, and I think them most telling and picturesque in the woods, especially among conifers.

DECEMBER.

I quite forgot to say anything in my last month's notes about our most brilliant of November flowers, and as they are still very nearly at their best I may honestly describe them as plants flowering to perfection in winter. What I refer to is *Schizostylis coccinea* from Natal, and for the benefit of those who do not know them I will describe them as an elegant miniature, intensely scarlet Gladiolus, which, although they have been cultivated in Britain for many a long year, are not half so well known or half so much grown as they deserve to be. The Schizostylis would be much admired even if its flowering season were in June or July. How much more valuable is it therefore when flowering in winter, as it does here on this West Coast to such perfection! It simply seems to revel in our soil and climate, though I must confess that I have never known it do, even tolerably, anywhere on the East Coast.

We have to-day (December 11) got vases on the table of Schizostylis and Christmas Roses, and what a lovely contrast they are! though it is far easier to grow the former than the latter here. To show off the Schizostylis to perfection, one wants a cosy, warm dining-room, with the table all decorated with it, as ours is here, under electric light, and then their brilliancy is as marvellous as a bush of *Rhododendron Thomsoni* in bright April sunshine, which is about the most dazzling object I know of in the whole floral world.

I had also all but forgotten to say anything about my Bamboos, and as they are at their very best in mid-winter, December is surely the time to describe them. Visitors to my shrubberies often remark on their size and luxuriance, which does not perhaps strike me so much, being accustomed to seeing them so thriving in certain spots in Argyllshire. I grow a lot of varieties, and they nearly all do equally well. Perhaps the best doer is *Arundinaria anceps*, and a big mound of it is certainly a grand object. The other day a visitor, who was much struck by one of the clumps, made me stand alongside of it so as to judge its height, and he reckoned the canes to be fully twenty feet high, and all these tall shoots are the growth of one season—viz. a couple of months just during July and August.

I have also three grand climbers which I must not forget to praise, and two of them are especially adapted to climbing up the bare stems of trees, as they will do without the help of any wire netting. One of the first objects to attract the eye of any visitor to my shrubberies in December is that delightful Tasmanian climber, *Billardiera longifolia*, covered with large blue berries, climbing up a silver birch tree. It is not, I think, very commonly seen in North Britain though it

grows and fruits so freely here. It requires wire netting to help it up, but I have two other more or less uncommon climbers, which run up the tree-stems without any help, and I can most strongly recommend them both to everyone. They are the climbing Hydrangea, commonly known by another awful name—viz. *Schizophragma hydrangeoides*, and the rather newer Chinese *Actinidia chinensis*. These three climbers are entirely different the one from the other, but each one has its own great merits.

The shrubberies do not look a bit wintry yet, as most of the New Zealand and Chilean shrubs and trees are evergreen, and even some of the deciduous trees, such as the Magnolias (and especially *Magnolia Campbelli*), are still in their summer dress, and one is only reminded of the actual lateness of the season by the early Narcissi and snowdrops showing up where the blackbirds have scratched their covering of leaves off them.

Next to the Schizostylis, the brightest objects in the garden are big clumps, four feet high, of *Fuchsia gracilis*. They are still nearly at their best, while our hedges of *Fuchsia Riccartoni*, and the large-flowered *Fuchsia globosa*, are quite over.

Another December flower struck me to-day as being very brilliant, and that was the intensely blue *Lithospermum prostratum*, which does so well here, and which often flowers nearly as freely in January as in June.

To show what our climate here is, I may finish up by mentioning that this is the 9th of December, and that there has not been as much as one degree of frost at Inverewe yet!

[The foregoing notes refer to the year 1916.—ED.]

METEOROLOGICAL OBSERVATIONS AT WISLEY, 1916.

By R. H. Curtis, F.R.H.S.

The weather of 1916, regarded from a gardener's point of view, was by no means ideal. Taking a broad retrospect, it was cold and wet, with a marked deficiency of bright sunshine, and with more strong winds and gales than are usually experienced. The outstanding climatic features of the year are shown graphically in figs. 30–33; and especially in fig. 30, where the coolness of the two mid-summer months, June and July, is strikingly exhibited by the deep drop of the temperature line below the normal; whilst fig. 31 shows that in June the normal march of temperature was reversed, and the mean for the month was actually, as well as relatively, lower than that of May. Gales were most frequent in the early and late months of the year, but by far the most serious to horticulturists was that which occurred at the end of March, when over all the southern counties of England much damage was caused to trees, whose branches, already heavily weighted by clinging snow, were carried away by the violent squalls; or the tree was entirely up-rooted and destroyed. Fig. 30 also shows that whilst the year began with an unusual amount of warmth, the mean temperature in January having been more than six degrees *above* the normal, it closed with a nearly equal departure from the mean in the opposite direction, the December mean temperature being nearly six degrees *below* the normal. The figure also shows that the unusual wetness of the *year* was chiefly due to the excessive falls of rain in the second and third, and the tenth and eleventh months; the falls in the other eight months varied only by small amounts from their averages, and the mean for the whole eight was fairly normal.

The chief features of the weather of the several months were as follows:

January.—The year opened with a southerly to westerly gale, which blew for several hours with more than usual violence over the whole of the United Kingdom. This gale was the first of a series, all of which travelled slowly along an easterly path, well to the north of the British Isles, and caused an almost continuous succession of strong westerly winds, and with them a persistently high temperature, and the mildest January experienced over Great Britain for very many years. January is the mid-winter month, and generally the coldest month of the year; but on this occasion there was practically no winter; no snow fell, and the few frosts which occurred were slight and of brief duration. The result of this unusual warmth was very manifest in the Gardens, the spring flowers opening in an extraordinary way—early Rhododendrons, Anemones, Narcissi, Scillas, Saxifrages, Primroses, Violets, Snowdrops, Irises, and very many others, blooming quite early in

the month; indeed, the forward state of vegetation approximated closely to what is common in the extreme south-western parts of the

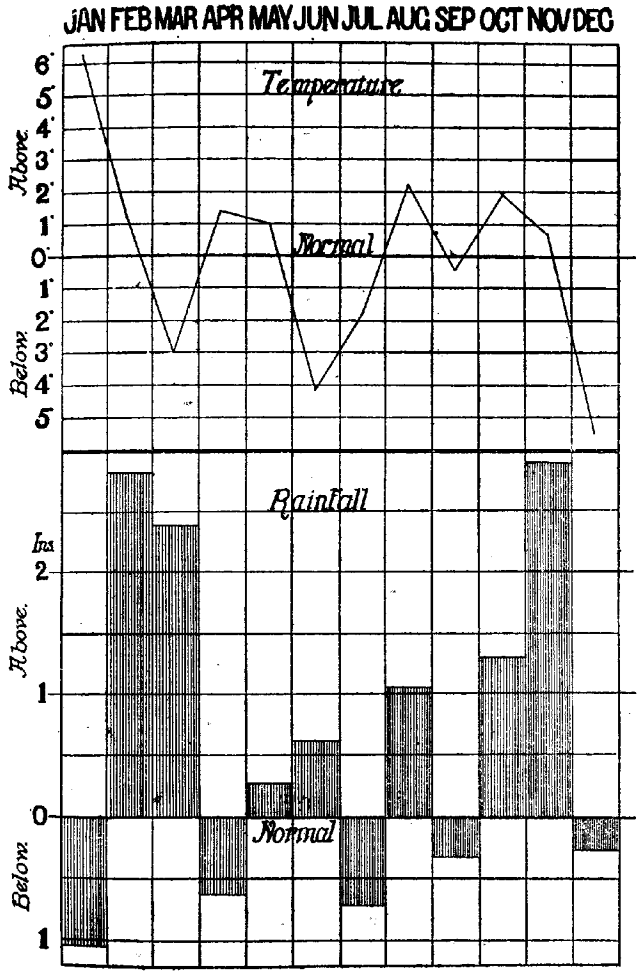


FIG. 30.—DIFFERENCES OF THE MONTHLY MEAN OF TEMPERATURE AND RAINFALL FROM THE AVERAGE.

kingdom, but is only very rarely experienced in the south-east. In the southern counties generally there was less rain than usual, and at Wisley the fall was less than half the average amount; but over the greater part of the eastern and midland counties also the rainfall was

small, and it was only in the north and north-west that any large falls occurred.

The results of the observations made at Wisley are shown in the following table:

Mean temperature of the air in shade	45·4°		
Highest " " "	56°	on the	1st
Lowest " " "	27°	"	23rd
" " on the grass	15°	"	23rd
Number of nights of ground frost			13

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	43·8°	44·6°	45·4°
Highest " " "	47°	46°	46°
Lowest " " "	41°	44°	45°

* Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 90 per cent.

Rain fell on 12 days, to the total depth of 0·78 in. (equivalent to about 3½ gallons of water to the square yard). Heaviest fall on any day 0·18 in., on the 2nd.

The prevailing winds were south-westerly.

The average velocity of the wind was 9 miles an hour.

There were 47 hours of bright sunshine, equal to 18 per cent. of the greatest possible amount.

There were 13 days on which no sunshine was recorded.

February.—In some respects the weather of the first half of this month resembled pretty closely that of its predecessor, and was both windy and mild, and, with the exception of one day of very heavy rain, it was not unusually wet. But in the latter half of the month a great change, with the development of quite another type of weather, was experienced. The mild westerly winds gave place to a cold current of air from the north and north-east, which brought with it frequent snow and cold rain, and a great fall in temperature, and made it impossible to carry on the usual out-of-door work in the Garden. The fall of snow was at times deep; and in many parts quite unusual drifts were formed, and continuing for many days they entirely buried everything of dwarf habit in the Garden. At Wisley the total precipitation for the month, which of course includes snow, was three times the average amount, and over a very large part of England it was double. In some exposed parts of south-west England the snow-drifts were reported as being from ten to twelve feet deep! The month was exceptionally dull, the average duration of bright sunshine at Wisley being but a little over two and a half hours a day, or one quarter of the possible amount.

The average values obtained from the daily observations made at the Observatory in the Garden are shown in the following table:

Mean temperature of the air in shade	39·2°		
Highest " " "	53°	on the	15th
Lowest " " "	22°	"	25th
" " on the grass	7°	"	25th
Number of nights of ground frost			24

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	40·6°	42·7°	44·3°
Highest " " "	44·3°	44·7°	45·6°
Lowest " " "	36·5°	39·5°	42·5°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 88 per cent.

Rain fell on 20 days, to the total depth of 4·20 in. (equivalent to about 19¼ gallons of water to the square yard). Heaviest fall on any day 0·93 in., on the 3rd.

The prevailing winds were northerly—from between north-west and north-east.

The average velocity of the wind was 9 miles an hour.

There were 79 hours of bright sunshine, equal to 27 per cent. of the greatest possible amount.

There were 7 days on which no sunshine was recorded.

March.—In some respects the weather of this month was very remarkable. It was unusually cold all over the kingdom; at Wisley the maximum temperature reached 50° on six occasions only, whilst the minimum fell below 40° nearly every day, and on the 9th it fell so low as 18°. It was also another very wet month, the rainfall being double the average, or even more, over all the southern and eastern counties of England; and at Greenwich it was the wettest March since rainfall observations were begun there in 1815. On the other hand, in some western portions of the kingdom, which are usually the wettest, the rainfall was only a quarter of the average amount. So far as the Garden at Wisley was concerned, this exceptional rainfall, combined with the cold, involved further delay in getting on with seasonable outdoor work, and very much hindered the growth of all spring flowers. Another feature of the weather was the absence of high winds until towards the close of the month, when gales followed each other in quick succession. One that occurred on the 27th–28th was accompanied by a heavy fall of snow, and did a vast amount of damage to trees and gardens over a very wide area. From Guernsey it was reported that nearly one hundred greenhouses had been completely wrecked; whilst at Windsor, Bushey Park, and Kew Gardens much damage was done to large trees.

The mean results yielded by the daily observations made at Wisley are as follows:

Mean temperature of the air in shade	39·4°	
Highest " " "	58·4°	on the 19th
Lowest " " "	18°	" 9th
" " on the grass	11°	" 9th
Number of nights of ground frost		22

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	39·5°	40·6°	41·8°
Highest " " "	44·1°	43·3°	42·7°
Lowest " " "	35·6°	38·1°	40·5°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 93 per cent.

Rain fell on 21 days, to the total depth of 4·57 in. (equivalent to about 21½ gallons of water to the square yard). Heaviest fall on any day 0·96 in., on the 27th.

The prevailing winds were north-easterly.

The average velocity of the wind was 6 miles an hour.

There were 64 hours of bright sunshine, equal to 18 per cent. of the greatest possible amount.

There were 13 days on which no sunshine was recorded.

April.—The month opened with rather warmer weather than had been experienced for some time, although the nights were still cold for

the time of year, and some sharp ground-frosts occurred. Then ensued a spell of changeable weather, with lower day temperatures and more or less rain, but still with a record of sunshine on nearly every day, although sometimes only a very brief one. A very decided improvement then took place—a milder air current set in, the weather became quite dry, and the closing days of the month were warm and brilliant. Taking the month as a whole, it may be fairly described as sunny and warm, the mean temperature having been about half a degree above the average, whilst the amount of bright sunshine recorded was very nearly half the possible amount. The middle of the month was rather

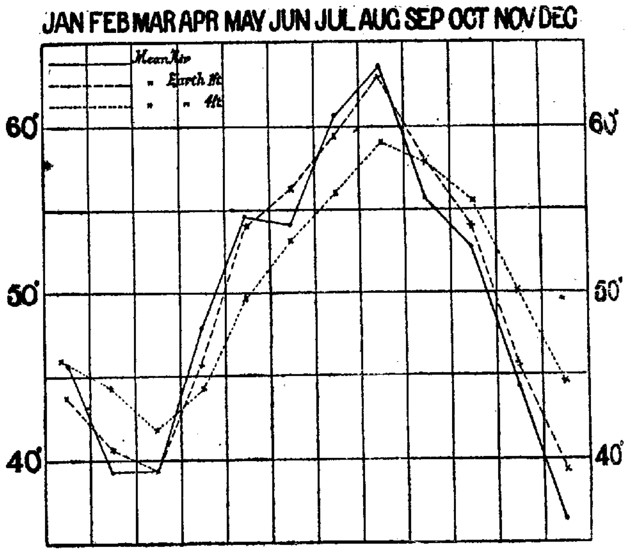


FIG. 31.—MEAN TEMPERATURE OF THE AIR, AND OF THE SOIL AT THE DEPTH OF ONE FOOT AND OF FOUR FEET BELOW THE SURFACE, FOR EACH MONTH.

windy, but there were no gales in the south-eastern portion of the kingdom, and nothing to retard garden work, so that the arrears due to the bad weather of the preceding months could be overtaken, and at the same time vegetation—and especially bulbs—made good progress.

The results of the daily observations made at the Meteorological Observatory in the Gardens are as follows :—

Mean temperature of the air in shade	48°		
Highest ,, ,, ,,	75°	on the	27th
Lowest ,, ,, ,,	30°	,,	8th
,, ,, on the grass	19°	,,	8th
Number of nights of ground frost			16

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	45·7°	45·4°	44·3°
Highest ,, ,, ,,	52·7°	50·2°	46·9°
Lowest ,, ,, ,,	42·6°	42·7°	42·5°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 76 per cent.

Rain fell on 12 days, to the total depth of 0·98 in. (equivalent to about 4½ gallons of water to the square yard). Heaviest fall on any day 0·23 in., on the 19th.

The prevailing winds were northerly—from north-west to north-east.

The average velocity of the wind was 7 miles an hour.

There were 193 hours of bright sunshine, equal to 47 per cent. of the greatest possible amount.

There were no days on which sunshine was not recorded.

May.—Nearly the whole of the first half of this month was dull and sunless, and with the exception of one or two days of exceptional warmth, it was cool for the time of year. The second half, however, brought with it a marked change, and it was both drier and brighter, and very much warmer than usual, so much so, indeed, that, notwithstanding the cool first half, the mean temperature for the whole month was considerably above the average. On the 21st the shaded thermometer at the Gardens registered 80°, whilst in London 85° was recorded. The latter half of the month was also very dry over the whole of the eastern and south-eastern counties, but taking the month as a whole the fall of rain was more or less in excess of the average all over the kingdom. To this condition of things not only did vegetation quickly respond, but insect life also became very active, the eggs of some pests being hatched out at so great a rate as to play havoc with the foliage of nearly all deciduous trees. There were no frosts all through the month.

The mean results of the daily readings of the instruments at the Gardens are given in the following table:

Mean temperature of the air in shade	54·7°		
Highest " " "	80°	on the	21st
Lowest " " "	35°	"	27th
" " on the grass	24°	"	27th
Number of nights of ground frost			9

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	54·2°	49·8°	49·8°
Highest " " "	59°	56°	53°
Lowest " " "	49·5°	50°	47°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 76 per cent.

Rain fell on 11 days, to the total depth of 1·76 in. (equivalent to about 8½ gallons of water to the square yard). Heaviest fall on any day 0·40 in., on the 12th.

The prevailing winds were westerly.

The average velocity of the wind was 5 miles an hour.

There were 195 hours of bright sunshine, equal to 41 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

June.—The weather of this month was altogether abnormal, and as regards temperature it is probably safe to say that so cold a June had not been experienced for at least three quarters of a century. All over England and Wales, and in parts of Scotland and Ireland, there was a great deficiency of bright sunshine, and in consequence a continued succession of low maximum temperatures day after day, and to this, perhaps more than to low night temperatures, the very low

mean temperature was due. At Wisley on the warmest day the temperature did not exceed 70°, and the mean of all the maxima throughout the month was only a little above 60°. The effect of this continued absence of warmth soon became apparent in the Garden: in one district the leaves of trees exposed to the north became withered, chestnuts became quite brown, and beeches looked as they usually do in autumn. At Wisley all vegetation was slow in growth; such things as peas did not fill well, and tomatos set indifferently, whilst mildew spread rapidly in rose beds. The rainfall at Wisley was less than the average, but in several parts of the kingdom it largely exceeded it, especially in the far north; speaking generally, however, the month was one of moderate wetness.

The results of the daily observations at Wisley are summarized in the following table:

Mean temperature of the air in shade	53·9°		
Highest „ „ „	70°	on the	24th
Lowest „ „ „	37°	„	17th
„ „ on the grass	27°	„	3rd
Number of nights of ground frost			5

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	56·2°	55·3°	53·2°
Highest „ „ „	58·6°	56·8°	54·5°
Lowest „ „ „	53·8°	53·8°	52·7°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 77 per cent.

Rain fell on 16 days, to the total depth of 1·55 in. (equivalent to about 7¼ gallons of water to the square yard). Heaviest fall on any day 0·25 in., on the 4th.

The prevailing winds were south-westerly.

The average velocity of the wind was 5 miles an hour.

There were 151 hours of bright sunshine, equal to 31 per cent. of the greatest possible amount.

There was only 1 day on which no sunshine was recorded.

July.—The type of weather which had caused the cold and gloomy conditions of June persisted throughout the first half of July, and little or no improvement was shown throughout that period; but soon after the second half of the month had been entered upon a change took place, and very welcome warmer weather set in. The improvement was not general, however, all over the kingdom, and the eastern parts of England, and some other districts, were still waiting for summer conditions to show themselves. At Wisley the highest temperature occurred on the 29th, when 83° was reached; and for the first time in the year the month passed without a ground frost being recorded at the Gardens. The month was also a dry one over the kingdom generally, and at Wisley the fall of rain only reached half the normal amount. The record of bright sunshine was low everywhere, and at the Society's Gardens averaged only 5½ hours a day, or thirty-five per cent. of the possible amount; during the last three days this had increased to 13 hours a day. The effect of the warmer weather soon became apparent in the Gardens, and all the more so as vegetation had been checked for so long. Peas especially made extraordinary growth, and by the close of the month were two feet above their normal height.

During the last week, however, the heat and drought combined caused vegetation to suffer considerably.

The results of the daily meteorological observations are summarized in the following table:

Mean temperature of the air in shade	60·3°		
Highest " " "	83°	on the	30th
Lowest " " "	41°	"	2nd
" " on the grass	35°	"	15th
Number of nights of ground frost			None

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	59·7°	58·3°	55·8°
Highest " " "	63°	61°	58°
Lowest " " "	58°	57°	55°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 78 per cent.

Rain fell on 8 days, to the total depth of 0·80 in. (equivalent to about 3¾ gallons of water to the square yard). Heaviest fall on any day 0·34 in., on the 6th.

The prevailing winds were from between south-west and north-west.

The average velocity of the wind was 4 miles an hour.

There were 171 hours of bright sunshine, equal to 35 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

August.—The dry weather of the latter part of July was prolonged throughout the first half of August, by which time rain had everywhere become badly needed, since there had been a continuous succession of bright, hot days, on many of which the temperature had exceeded 80°, lasting for nearly four weeks. This drought was now followed by a spell of unsettled rainy weather, lasting till the close of the month, by which time the fall of rain had everywhere exceeded the usual amount for the entire month, and in some districts the excess was very considerable. Quite at the close of the month there was a very heavy and prolonged downpour over a great part of south-western England, which resulted in falls of between three and four inches in less than twenty-four hours. The temperature during this latter half of August, notwithstanding the rain, differed very little from the normal, so that, taking the entire month, the mean temperature was two degrees in excess of the average; and regarding its weather generally, from a gardener's point of view, it was a very satisfactory month.

The observations made at the climatological station at Wisley give the following results:

Mean temperature of the air in shade	63·4°		
Highest " " "	83·4°	on the	1st
Lowest " " "	44·1°	"	31st
Lowest " on the grass	35·2°	"	5th
Number of nights of ground frost			none

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	62·8°	61·7	59·2°
Highest " " "	65°	63°	60°
Lowest " " "	59°	61°	58°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 78 per cent.

Rain fell on 15 days, to the total depth of 3·23 in. (equivalent to about 15

gallons of water to the square yard). Heaviest fall on any day 0·79 in., on the 29th.

The prevailing winds were south-westerly and north-easterly.

The average velocity of the wind was 4 miles an hour.

There were 184 hours of bright sunshine, equal to 41 per cent. of the greatest possible amount.

There was 1 day on which no sunshine was recorded.

September.—The weather throughout this month was generally quiet, with a nearly normal temperature, and rather less than the

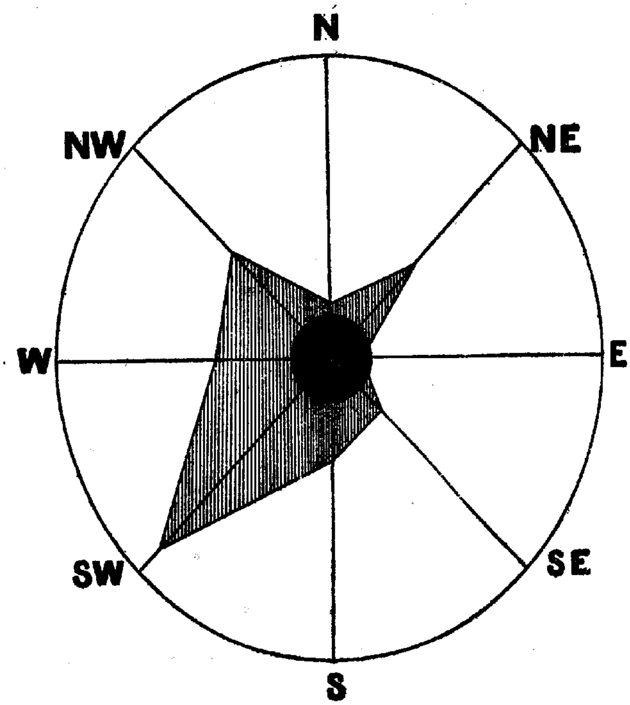


FIG. 32.—DISTRIBUTION OF WINDS DURING THE YEAR. THE RELATIVE FREQUENCY OF CALMS IS SHOWN BY THE SHADED CIRCLE IN THE CENTRE.

usual amount of rain, but with a marked deficiency of bright sunshine, so that it may fairly be described as dry but dull. Nowhere was there any prolonged spell of sunny weather, and at the Gardens the average daily deficiency amounted to nearly two hours. On the other hand, there were no sharp autumnal ground frosts, such as frequently occur in September, although on two or three occasions slight ones were recorded; and in consequence right up to the close of the month a quite extraordinary growth of vegetables was maintained, whilst fruit buds rapidly swelled, trees and shrubs maintained their greenness

and freshness in a quite remarkable degree, and roses continued to bloom freely.

The results obtained from the meteorological instruments at the Observatory in the Garden are as follows:

Mean temperature of the air in shade	55·8°		
Highest „ „ „	71·6° on the 25th		
Lowest „ „ „	33·5° „ 22nd		
„ „ on the grass	28° „ 15th		
Number of nights of ground frost			6
	At depth of		
	1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	57·7°	58·3°	57·8°
Highest „ „ „	61°	61°	59·5°
Lowest „ „ „	54°	56°	56°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 87 per cent.

Rain fell on 13 days, to the total depth of 1·46 in. (equivalent to nearly 7 gallons of water to the square yard). Heaviest fall on any day 0·35 in., on the 1st.

The prevailing winds were north-easterly and north-westerly.

The average velocity of the wind was 4 miles an hour.

There were 105 hours of bright sunshine, equal to 28 per cent. of the greatest possible amount.

There were 2 days on which no sunshine was recorded.

October.—With the commencement of this month the weather underwent a complete change in its character, and the generally quiet conditions which had prevailed right through the summer gave place to weather of a stormy and unsettled type, which continued with but little intermission until its close. As regards temperature, the first half of the month was unusually warm, the daily maximum at the Gardens being between 60° and 70° throughout, whilst the night temperatures were also abnormally high, and on many nights fell very little below 60°, so that the weather was uniformly mild throughout the twenty-four hours. On the 15th, however, a complete change took place, and the southerly winds which had caused these quiet conditions gave place to strong currents of a different type, that brought with them an abrupt fall of temperature, and occasional ground frosts at night, by which such plants as Gunneras and Dahlias were killed, although, notwithstanding the cold, the foliage of trees maintained its colour, with scarcely any fall of leaves, right up to the end of the month. There was everywhere less sunshine than usual, but the deficiency was particularly marked in the western districts, where at this time of the year there is generally more sunshine than in other parts of the kingdom. At Wisley thirty per cent. of the possible amount was registered, but over Cornwall and Devon the percentage was in many places as low as twenty. Rainfall was everywhere in excess of the normal amount, and at Wisley the excess was nearly fifty per cent.; but the north-eastern and eastern counties of England were the only districts in which the fall was normal.

The results of the observations made at Wisley are as follows:

Mean temperature of the air in shade	52·7°
Highest „ „ „	67° on the 5th
Lowest „ „ „	27° „ 21st
„ „ on the grass	19° „ 21st
Number of nights of ground frost	8

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	53·9°	54·9°	55·2°
Highest ,, ,, ,,	59°	58°	57°
Lowest ,, ,, ,,	48°	51°	52°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 88 per cent.

Rain fell on 22 days, to the total depth of 4·36 in. (equivalent to about 20½ gallons of water to the square yard). Heaviest fall on any day 0·60 in., on the 27th.

The prevailing winds were south-westerly.

The average velocity of the wind was 7 miles an hour.

There were 98 hours of bright sunshine, equal to 30 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

November.—This was an extremely wet and stormy month, there being an almost constant succession of gales, some of them of great violence, which kept the weather in a very unsettled state. The dominant winds were south-westerly, and they brought with them not only a heavy rainfall, but also a temperature generally in excess of the average, and at times some really warm days. Night-frosts, too, were fewer than is usual at this season, and as a result the leaves remained in quite a remarkable manner on all deciduous trees till the end of the month. In nearly every part of the kingdom the rainfall exceeded the normal for the month, but in some districts the excess was large; at the Wisley Gardens it was more than double the average, and the excessive wetness greatly hindered all outdoor operations; indeed, in nearly all parts of the country work on the land was greatly retarded, and in the Thames valley, where there were heavy floods following upon the downpours of the first week of the month, it was to a great extent stopped altogether.

The results yielded by the daily observations made at Wisley are as follows:

Mean temperature of the air in shade	44°	
Highest ,, ,, ,,	58°	on the 11th
Lowest ,, ,, ,,	25°	,, 28th
Lowest ,, on the grass	13°	,, 28th
Number of nights of ground frost		18

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	45·7°	47·9°	50·0°
Highest ,, ,, ,,	49°	51°	52°
Lowest ,, ,, ,,	41°	44°	47°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 91 per cent.

Rain fell on 13 days, to the total depth of 5·03 in. (equivalent to about 23½ gallons of water to the square yard). Heaviest fall on any day 0·77 in., on the 5th.

The prevailing winds were south-westerly.

The average velocity of the wind was 7 miles an hour.

There were 61 hours of bright sunshine, equal to 23 per cent. of the greatest possible amount.

There were 9 days on which no sunshine was recorded.

December.—At Wisley, and over the whole of the south-eastern portion of England, the weather of this month was in one respect very exceptional, inasmuch as there was an entire absence of rough weather, although December is as a rule the stormiest month of the year. In

other respects, however, its weather was typical—it was very cold, and there were several sharp frosts; there was the normal amount of rain, and with it a good deal of snow; there was also very little bright sunshine, but a good deal of dull, overcast weather, and in some districts much mist and fog; some of the densest fogs were very

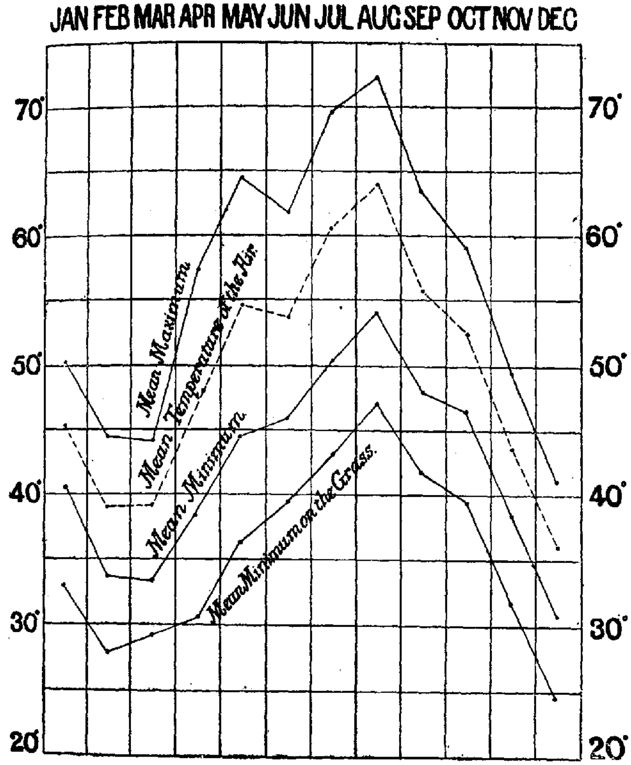


FIG. 33.—MEAN TEMPERATURE OF THE AIR; MEAN MAXIMUM AND MEAN MINIMUM TEMPERATURE OF THE AIR; MEAN MINIMUM TEMPERATURE ON THE GRASS, FOR EACH MONTH.

widespread and caused great interruption to traffic, and in the case of one, which occurred just after Christmas, there were many deplorable accidents in London and its suburbs. The month was in short quiet, fairly dry but abnormally dull, and very cold. The effect of this, following upon a succession of cool months, was to cause a general retardation of vegetation, and at Wisley many things in the Garden were practically a month later in development than usual—autumn-sown peas were nearly a month later germinating than in 1915, and

Hellebores, Hamamelis, and *Berberis Bealei* were a month or even more later than is usual in flowering.

The results from the observations made in the Garden are as follows:

Mean temperature of the air in shade	36·1°		
Highest " " "	51°	on the	29th
Lowest " " "	24°	"	27th
" " on the grass	14°	"	16th
Number of nights of ground frost			25

	At depth of 1 ft.	2 ft.	4 ft.
Mean temperature of the soil at 9 A.M.	39·2°	41·6°	44·5°
Highest " " "	42°	44°	47°
Lowest " " "	36°	40°	43°

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 97 per cent.

Rain fell on 16 days, to the total depth of 2·42 in. (equivalent to about 11¼ gallons of water to the square yard). Heaviest fall on any day 0·49 in., on the 20th.

The prevailing winds were south-westerly.

The average velocity of the wind was 4 miles an hour.

There were 22 hours of bright sunshine, equal to 9 per cent. of the greatest possible amount.

There were 18 days on which no sunshine was recorded.

CELERIAC AT WISLEY, 1916.

SIXTEEN stocks of Celeriac were received for trial in 1916. The seed was sown in pots on March 20 and raised under glass, pricked out into boxes on April 11, and planted in the open ground in shallow trenches on June 8. The plants were 2 feet apart, in rows 2 feet apart. The ground was occupied by the cabbage trial of 1915, and when the cabbages were removed it was deeply dug, but no manure was added.

All plants in the trial remained free from the leaf-spot which affected the Celery (see Celery Trial), although some stocks of seed showed infection. All the seed was steeped in hydrogen peroxide, as is there described, before sowing (p. 109).

The Fruit and Vegetable Committee inspected the plants, which had made excellent growth, on December 14, and selected the following as the best in the trial:

No. 1. Celeriac from Messrs. Sutton.
3. Celeriac from Messrs. Sydenham.
12. Delicatesse from Messrs. Barr.
15. Late Summer from Messrs. Barr.

These were all highly commended (**XXX**).

All the varieties withstood without damage and unprotected the severe frosts of February 1917.

1*. Sutton's Strain (Sutton), **XXX** December 14, 1916.—Bulbs large, smooth, solid; plants dwarf, with little foliage.

2. Common (Barr).—Bulbs of medium size, rather warty, solid; plant tall, with much foliage.

3. Ordinary (Sydenham), **XXX** December 14, 1916.—Bulbs large, fairly smooth, solid; plants of medium height, with moderate foliage.

4. Early Large-rooted (Barr).—Bulbs of medium size, fairly smooth and solid; plant of medium height, with moderate foliage. Not quite true to name.

5. Large-rooted (Carter).—Bulbs large, fairly smooth, rather hollow; plants of medium height, with moderate foliage.

6. Giant Prague (Hurst).—Bulb large, fairly smooth, solid; plant tall, with much foliage. Very like 16, but more solid.

7. Short-leaved (Barr).—Bulb large, rather rough; plants mixed, of tall and medium height, with moderate foliage.

8. Giant Short-leaved (Barr).—Bulb large, fairly smooth, slightly hollow; plants mixed, of tall and medium height, with moderate foliage.

* All plants grown in the Trials are known by a number only until the trial is finished and judgment completed.

9. Paris Market (Barr).—Bulbs large, rough, with many rootlets, slightly hollow; plants of dwarf to medium height, with moderate foliage.

10. Improved Paris (Cooper-Taber).—Bulbs large, rough, with many rootlets, slightly hollow; plants of medium height (some dwarf), with moderate foliage.

11. Non Plus Ultra (Barr).—Bulbs large, rough, with many rootlets, hollow; plants of medium height, with moderate foliage.

12. Delicatesse (Barr), **XXX** December 14, 1916.—Bulbs of medium size, smooth; flesh white, slightly hollow; plant of dwarf to medium height, with little foliage.

13. Apple-shaped (Barr).—Bulbs of medium size, smooth, slightly hollow; plants of dwarf to medium size, with little foliage.

14. Large Erfurt (Hurst).—Bulbs of medium size, rough, hollow, pithy; plants tall, with much foliage of more erect habit than other varieties.

15. Late Summer (Barr), **XXX** December 14, 1916.—Bulbs of small to medium size, smooth, solid; plants very dwarf, with little foliage, which is variegated. This variety matures early.

16. Smooth Prague (Dawkins).—Bulbs of large size, fairly smooth, slightly hollow; plants tall, with much foliage. (See No. 6, which is more solid.)

CELERY AT WISLEY, 1916.

FIFTY stocks of Celery were included in the trial of Celery in 1916. The seed was all sown on March 20 in pots under glass; the seedlings were pricked out into boxes on April 11, and transplanted into the trenches on June 6. The ground had been occupied partly by early-flowering chrysanthemums, partly by winter greens in 1915; it was not dug, but trenches about 12 inches wide and 6 feet apart were taken out; into each trench (36 feet in length) two wheelbarrow loads of manure were worked. The plants were set out in a single row 9 inches from plant to plant, and made very good progress until the last week in August, when the Celery leaf-spot disease (due to the fungus *Septoria Petroselini* var. *Apii*, see JOURNAL R.H.S., vol. xxxvii. p. 115, and xl. p. 476) made its appearance in three varieties and quickly spread to others. The three varieties, which were very badly attacked, viz. Nos. 21, 22, and 33, were dug up and burned, and are not described below. Curiously enough, they were all varieties which had received awards in previous trials, seed of which had been purchased for comparison with newer varieties.

The seed sent in was examined when received, and as it was found in several cases to be infected with the fungus above referred to, it was treated by steeping for two hours in a solution of hydrogen peroxide (20 vols.); some of the Celeriac seed also was found to be infected, and this too was steeped. The seed was subsequently dried before sowing, and in no case was the germination adversely affected. Unfortunately, at the time of the treatment, hydrogen peroxide was difficult to get and probably some used was less good than the rest, which may account for the outbreak in the three varieties mentioned. There is no doubt that the handling in removing side shoots preparatory to earthing up and the like assisted in the spread of the fungus, which imposed a serious check upon the plants. Its progress was stopped by spraying on four occasions with Burgundy mixture, different strengths as follows being used on different dates:

Sept. 1.—Copper sulphate, 1¼ lb.; washing-soda, 1½ lb.; soap-powder, 25 oz.; water, 50 gallons.
" 7.—Copper sulphate, 1½ lb.; washing-soda, 1¾ lb.; soap-powder, 25 oz.; water, 50 gallons.
" 14.—Copper sulphate, 1¾ lb.; washing-soda, 2 lb.; soap-powder, 25 oz.; water, 50 gallons.
" 30.—Copper sulphate, 2 lb.; washing-soda, 2¼ lb.; soap-powder, 25 oz.; water, 50 gallons.

Owing to the check imposed by the disease and the heavy rainfall in October earthing up was much delayed. It was commenced in the first week in October, a second earthing was given in the last week of that month, and a final one in the third week in November.

The Celery fly did little damage, for although it made its appearance about the middle of October its progress was stopped by frost.

The Fruit and Vegetable Committee inspected the Trial at intervals during growth, and made their final examination on December 14, when they selected the following stocks as the best in the Trial:

Award of Merit (**A.M.**).

No. 11, 'Invincible White' from Messrs. Dobbie; 30, 31, 'Claygate Prize Pink' from Messrs. Sydenham and Hurst.

Highly Commended (**XXX**).

No. 6, 'Early Rose' from Messrs. Hurst; 26, 'Matchless Pink' from Messrs. Alex. Dickson; 49, 'Incomparable Crimson' from Messrs. Carter.

The severe frosts of February tried the plants very much, but protection afforded by placing dry bracken in the spaces between the ridges proved very effective.

VARIETIES.

1. Soup Celery.
2. New White.
3. Borough Market Champion White.
4. Incomparable White.
5. White Gem.
6. Early Rose.
7. A 1.
8. Covent Garden Tall White.
9. Giant White.
10. Sandringham Dwarf White.
11. Invincible White.
12. Matchless White.
13. Incomparable White.
14. Solid Ivory.
15., 16. Solid White.
17. Champion White.
18. Champion Solid White.
19., 20. White Perfection.
21. Aldenham White.
22. Defiance White.
23. Prize White.
24. Superb Pink.
25. New Solid Pink.
26. Matchless Pink.
27. Favourite Pink.
28.–31. Clayworth Prize Pink.
32. Prize Pink.
33. Grove Pink.
34.–36. Aldenham Pink.
37. Aldenham Prize Pink.
38. Pink Beauty.
39. Pink Perfection.
40. Giant Pink.
41. Covent Garden Tall Red.
42. Solid Red.
43. Mammoth Red.
44., 45. Standard Bearer.
46. Matchless Red.
47. Selected Red.
48. Prize Red.
49. Incomparable Crimson.
50. Sulham Prize.

WHITE VARIETIES.

Both inner and outer leaf-stalks white.

Early.

3. Borough Market Champion White (Cooper-Taber).—Tall; of medium thickness; heart rather loose; flesh soft, pithy; flavour full.

4. Turner's Incomparable White (Nutting), **A.M.** December 18,

* See p. 107.

1907.—Of medium height and thickness; heart solid; flesh crisp; flavour fair.

5. White Gem (Sutton).—Of medium height and thickness; heart solid; flesh crisp; flavour full.

Later.

17. Champion White (Veitch).—Tall; thick; heart solid; flesh pithy; flavour fair.

18. Champion Solid White (Barr), **A.M.** December 18, 1900.—Of medium height; thick; heart rather loose; flesh crisp; flavour fair.

8. Covent Garden Tall White (Barr).—Tall; of medium thickness; heart solid; flesh crisp; flavour fair.

9. Giant White (Hurst).—Tall and rather thin; heart rather loose; flesh crisp; flavour fair.

13. Incomparable White (Sutton).—Tall; thick; heart solid; flesh rather pithy; flavour fair.

11. Invincible White (Dobbie), **A.M.** December 14, 1916.—Tall; fairly thick; heart solid; flesh crisp; flavour good.

12. Matchless White (Dickson).—Tall; thick; heart solid; flesh rather pithy; flavour full.

2. New White (Dobbie).—Of medium height; rather thin; heart fairly solid; flesh rather pithy; flavour good.

23. Prize White (Nutting).—Of medium height; thick; heart fairly solid; flesh crisp; flavour fair.

10. Sandringham Dwarf White (Hurst).—Tall; thick; heart solid; flesh rather pithy; flavour fair.

14. Solid Ivory (Carter).—Of medium height and thickness; heart fairly solid; flesh crisp; flavour fair.

15. Solid White (Sutton), **A.M.** November 23, 1897.—Of medium height; thick; heart solid; flesh crisp; flavour good.

16. Solid White (Simpson).—Of medium height; thick; heart rather loose; flesh crisp; flavour fair.

19. White Perfection (Veitch).—Tall; of medium thickness; heart fairly solid; flesh rather pithy; flavour fair.

20. White Perfection (Watkins & Simpson).—Of medium height and thickness; heart rather loose; flesh crisp; flavour fair.

PINK VARIETIES.

Both inner and outer leaf-stalks pink.

Early.

7. A 1 (Sutton).—Of medium height; thick; heart solid; flesh crisp; flavour good.

6. Early Rose (Hurst), **A.M.** December 18, 1900; **XXX** December 14, 1916.—Of medium height; thick; heart solid; flesh crisp; flavour good.

34, 35, 36, 37. Aldenham Pink (R. Veitch, Dawkins, Barr, Webb).—Tall and of medium thickness; heart solid; flesh crisp; flavour good.

Later.

28, 29, 30, 31. Clayworth Prize Pink (Dawkins, Watkins & Simpson, Sydenham, Hurst), **A.M.** to Nos. 30 and 31, adjudged the best stocks December 14, 1916.—Tall; thick; heart solid; flesh crisp; flavour good.

27. Favourite Pink (Dobbie).—Tall; thick; heart fairly solid; flesh pithy; flavour fair.

40. Giant Pink (Carter).—Tall; thick; heart fairly solid; flesh pithy; flavour strong.

26. Matchless Pink (A. Dickson), **XXX** December 14, 1916.—Tall; thick; heart solid; flesh crisp; flavour good.

25. New Solid Pink (Barr).—**A.M.** December 18, 1907.—Tall; thick; heart fairly solid; flesh crisp; flavour fair.

38. Pink Beauty (Barr), **A.M.** December 18, 1907.—Tall; thick; heart solid; flesh crisp; flavour strong.

39. Pink Perfection (Webb).—Tall; thick; heart solid; flesh crisp; flavour strong.

32. Prize Pink (Dickson & Robinson).—Of medium height; thick; heart solid; flesh crisp; flavour fair.

24. Superb Pink (Sutton).—Tall; thick; heart fairly solid; flesh crisp; flavour good.

RED VARIETIES.

Both inner and outer leaf-stalks red.

Later.

41. Covent Garden Tall Red (Barr).—Tall and of medium thickness; heart fairly solid; flesh crisp; flavour fair.

49. Incomparable Crimson (Carter), **XXX** December 14, 1916.—tall; thick; heart solid; flesh crisp; flavour good.

43. Mammoth Red (Webb).—Tall; thick; heart solid; flesh crisp; flavour fair.

46. Matchless Red (A. Dickson).—Tall; thick; heart solid; flesh crisp; flavour fair.

48. Prize Red (Nutting).—Tall and fairly thick; heart solid; flesh crisp; flavour good.

47. Selected Red (Dobbie).—Tall and fairly thick; heart solid; flesh crisp; flavour good.

42. Solid Red (Simpson).—Tall and thick; heart solid; flesh crisp; flavour good.

44, 45. Standard Bearer (Carter, Sydenham).—Tall and thick; heart solid; flesh crisp; flavour good.

50. Sulham Prize (Sutton).—Tall and thick; heart solid; flesh crisp; flavour good.

Green Variety.

1. Soup Celery (Barr).—Tall and thin; no heart; flesh soft. Grown without earthing up, and not blanched. Intended for flavouring, but not considered by the Committee worth growing in the face of better varieties. The plants may, however, be grown as biennials for the ripe seed which is useful for flavouring soups.

POTATOS: EXPERIMENTS IN CULTIVATION, ETC.

NOTE.—The experiments, the results of which are given below, were planned by the Wisley Staff in consultation with the Wisley Development Committee and were carried out by Messrs. CHITTENDEN, WRIGHT, and WILSON, with the assistance of Mr. W. ROGERS in weighing the crops. The labour involved in conducting and recording such experiments is great, and the Council feels that the special thanks of the Society are due to these members of the Wisley Staff for undertaking and carrying them to a successful conclusion, in spite of depleted staff and much additional heavy work.

Those conversant with the way in which wart disease is spreading will recognize the importance of tests in respect to the relative cropping and cooking qualities of wart-resisting varieties (see below).

Next in general interest to the trial of wart-resisting varieties is the spacing experiment (see p. 127). Needless to say, such experiments must be repeated in different soils and with different varieties before the results can be expected to influence general practice; the results obtained this year at Wisley point so uniformly to the conclusion that the closer planting gives the larger yield, that it may fairly be concluded that on such good potato soils as that at Wisley the closer planting may with advantage be practised, with the proviso that the closer the planting the greater the need for early and thorough spraying.

FREDERICK KEEBLE,
Director.

WART-RESISTANT POTATOS AT WISLEY, 1917.

The tumour, black scab, or wart disease of potatos, caused by the attack of the fungus *Synchytrium endobioticum* (or *Chrysophlyctis endobiotica*), fully described in the JOURNAL R.H.S. xxxvii., p. 362, has spread so far and so steadily that there seems grave danger that, in spite of all efforts to prevent it, the whole of the country will before long be infected. No soil or tuber treatment has yet been discovered, although much investigation has been carried out, which will control or even lessen the virulence of the disease, and the only means at present known of procuring a healthy crop of potatos when this fungus is present in the soil is to grow one or other of the varieties which the trials carried out by the Board of Agriculture have shown to be immune from attack.

The varieties which the Board has ascertained to be immune were (with two or three exceptions) collected from various sources and grown side by side at Wisley in 1917, in order to compare their

cropping and cooking qualities, and in the hope of encouraging the raising of further immune varieties possessing good qualities for garden cultivation. Such well-known and widely grown varieties as 'Up-to-Date' and all the forms similar to it, 'King Edward VII.,' and 'Arran Chief' fall ready victims to the disease, so that when attempts are made to grow them in soil infected with the fungus the whole crop is often lost. On the other hand, a considerable number have been discovered by trial to resist the attack of the fungus completely. What produces immunity is unknown, but it is apparently due to some constitutional characteristic found in whole families of potatos, such as the 'Abundance' type, seedlings of 'Great Scot,' and the like, and probably breeding from these varieties would lead to the production of even higher yielding varieties than at present exist. While many of those grown showed excellent cropping powers, none seems quite equal to the 'Up-to-Date' group in its power of yielding heavy crops. All the varieties mentioned below were grown, as the Table shows, from either Scotch or Irish seed, and the source of error in comparison between yields introduced by the use of English seed in competition with Scotch or Irish does not exist in this trial. It is, however, to be noted that seed from different parts of Scotland seems to vary in its cropping powers.

Forty tubers of each variety were planted in April in well dug, lightly manured soil, in rows 2 feet 6 inches apart and 18 inches apart in the rows. Several varieties had their growth checked about the beginning of August by an attack of Phytophthora, and none proved entirely immune, but none, with the exception of the earliest, showed much disease in the tubers, either at lifting time or subsequently. The varieties with coloured skins to the tubers appeared to be most resistant to the attack of Phytophthora in the foliage.

The importance of the elimination of "rogues" from resistant varieties scarcely needs comment, but is not always easy. Perhaps the greatest difficulty exists in keeping separate the many closely related forms of one type, such as those capable of being grouped round 'Abundance,' and this does not perhaps greatly matter, since all are apparently resistant. 'Great Scot,' however, a resistant variety, is not easily distinguished either in the tuber or in the growing plant from 'Arran Chief,' a variety that succumbs to the disease. There are characters by which those constantly dealing with the plants may be able to distinguish them from one another, but these characters are mainly comparative, and not always distinct. The most reliable seems to be the colour of the young shoot as it first appears, for that of 'Great Scot' is quite without purple tinge, while that of 'Arran Chief' is always purple. This difference is not always apparent in the older stems, for in these in both varieties the skin is often more or less tinged with purple.

The Vegetable Committee examined the Trials on two occasions, and as a result of their recommendations the awards shown in the following Table were made. The cooking qualities of some of the

WART-RESISTANT POTATOS, 1917.

Variety.	Seed from	Yield of 40 plants. Chats.	Yield of 40 plants. Ware and Seed.	Award.	Presented by or purchased from
*1. A1 . .	Scotland	5 6	87 4		Messrs. Sutton.
17. Abundance	Scotland	22 10	128 12		
26. Burnhouse Beauty	Scotland	16 0	116 13	XXX†	,, Dobbie.
4. Conquest .	Scotland	6 11	119 2	XXX	,, Sutton.
19. Culdees Castle	Scotland	7 3	107 6		,, Sutton.
45. Dominion .	Scotland	16 6	124 1	XXX	,, Dobbie.
16. Entente Cordiale	Scotland	8 12	153 15		,, Findlay.
3. Edzell Blue	Scotland	10 1	143 3		,, Dobbie.
13. Favourite .	Scotland	16 0	111 7	XXX	,, Dobbie.
14. Favourite .	Scotland	8 7	130 15		,, Sutton.
30. Golden Wonder	Scotland	2 9	142 3	A.M.	,, Dobbie.
31. Golden Wonder	Scotland	3 11	109 0		,, Sutton.
6. Great Scot .	Scotland	8 10	104 4	A.M.	,, Dobbie.
7. Great Scot .	Scotland	6 2	138 14		,, Sutton.
8. Great Scot .	Scotland	9 3	125 6		,, Veitch.
23. Jeanie Deans	Scotland	9 1	105 8		Mr. R. G. Holmes.
20. King Albert	Ireland	5 10	141 12	A.M.	,, Sands.
5. King George	Scotland	7 12	150 5	A.M.	Messrs. Sutton.
38. Kerr's Pink.	Scotland	4 10	137 11		,, Dobbie.
36. Heather Bountiful	Scotland	6 5	74 2		,, Sutton.
39. Irish Queen.	Scotland	2 12	95 6		,, Sutton.
40. Irish Queen.	Ireland	2 6	122 8		Mr. Sands.
27. Langworthy	Scotland	2 15	118 12	A.M.	Messrs. Dobbie.
28. Langworthy	Scotland	2 10	121 6		,, Sutton.
37. Leinster Wonder	Ireland	6 14	110 11		Mr. Sands.
2. Resistant Snowdrop	Scotland	10 3	107 15		Messrs. Dobbie.
32. Rob Roy .	Scotland	6 8	139 3	XXX	Mr. McAlister.
33. Rob Roy .	Scotland	2 15	119 10		Messrs. Veitch.
44. St. Malo Kidney	Scotland	6 14	128 10	XXX	,, Fidler.
41. Shamrock .	Ireland	3 6	122 9		Mr. Sands.
9. Sir Douglas Haig	Ireland	6 12	150 3	*See* Great Scot	,, Sands.
10. Southampton Wonder	Scotland	4 5	136 13		Messrs. Toogood.
25. The Admiral	Scotland	5 15	75 10		,, Dobbie.
22. The Crofter	Scotland	8 15	126 13	XXX	,, Dobbie.
21. The Provost	Scotland	2 15	89 2		,, Dobbie.
48. The Laird	Scotland	3 12	96 5		Mr. Davie.
12. The Ally .	Scotland	4 7	143 8		Messrs. Dobbie.
11. The Duchess	Scotland	8 7	136 7		,, Dobbie.
34. The Lochar	Scotland	10 5	163 15		,, Dobbie.
35. The Lochar	Scotland	10 8	142 0		,, R. Veitch.
46. Tinwald Perfection	Scotland	4 14	105 10		,, Dobbie.
24. Twentieth Century	Scotland	2 10	126 8	XXX	,, Sutton.
29. What's Wanted	Scotland	2 11	119 9	*See* Langworthy	,, Sutton.
42. White City .	Scotland	1 3	87 15	XXX	,, Dobbie.
43. White City .	Scotland	1 12	93 9		,, Sutton.

* See footnote, p. 107. † XXX means "highly commended."

varieties have again to be tested, as it is only after Christmas that some are at their best.

In addition to the varieties mentioned in the Table, two of which the powers of resisting wart disease are at present unknown, and four varieties which are known to be susceptible to the disease, were grown, viz. :—

Wart-resistance not ascertained.

'Keen's Seedling,' an early white kidney variety, sent by Mr. Notcutt. Crop, 85 lb. 8 oz., including 1 lb. 12 oz., chats. Seed grown in Suffolk.

'Western Hero,' an early white variety, sent by Messrs. R. Veitch. Crop, 93 lb. 10 oz., including 3 lb. 8 oz. chats. (Devonshire seed.) Introduced by Messrs. R. Veitch. **XXX** October, 1917.

Non-resistant varieties.

15. 'Midsummer Early,' an early white round variety, introduced and sent by Mr. Findlay. Crop, 129 lb. 6 oz., including chats 9 lb. 2 oz. Seed grown in Scotland.

A. 'Arran Chief,' a late white round variety, sent by Messrs. R. Veitch. Crop, 142 lb. 8 oz., including chats 5 lb. 19 oz. (Scotch seed.) Raised by Mr. D. McKelvie. **A.M.** 1915.

B1. 'Dalhousie,' a late white variety of the 'Up-to-Date' class from Mr. R. G. Holmes. Crop, 59 lb., including chats 1 lb. 15 oz. from 20 tubers. (Scotch seed.) **A.M.** 1905.

B2. 'Up-to-Date,' a late white variety from Mr. R. G. Holmes. Crop, 75 lb. 10 oz., including 1 lb. 8 oz. chats, from 20 tubers. (Scotch seed.)

DESCRIPTIONS.

I.—Early Varieties.

a. Tubers kidney, white.

2. Resistant Snowdrop.—Plant dull yellowish green; haulm 2 ft. 6 in., sub-erect, tinged; foliage medium, smooth; flowers white, many, persistent; tubers medium to large, rather variable in shape, rough, russeted; eyes shallow, eyebrows inconspicuous; flesh nearly white, firm; fairly mealy, white when cooked. Crop, 118 lb. 2 oz.; scabbed.* Lifted Aug. 13. Introduced by Messrs. Dobbie.

b. Tubers round or flat, white.

1. A1.—Plant shining deep green; haulm 18 in. to 24 in., spreading, tinged; leaves of medium size, somewhat wrinkled; flowers white, few, dropping; tubers medium, smooth, yellowish white; eyes of medium size with rather prominent eyebrows; flesh yellow, firm;

* The term "scab" refers to the common, skin-deep scab, not to the wart disease, or black scab.

rather close, yellow when cooked. Crop, 92 lb. 10 oz.; slightly scabbed. Lifted Aug. 7. Introduced by Messrs. Sutton.

16. Entente Cordiale.—Plant greyish green; haulm 18 in. to 21 in., sub-erect, tinged; foliage narrow, pointed; flowers white, many, dropping; tubers flat round, medium to large, rather irregular, smooth or slightly russeted, yellowish white; eyes rather deep, eyebrows prominent; flesh yellowish, firm; fairly mealy, yellow when cooked. Crop, 153 lb. 15 oz. Lifted August 7. Introduced by Mr. Findlay.

c. Tubers round, coloured.

3. Edzell Blue.—Plant grey-green; haulm 3 ft. 6 in., erect, dark; foliage medium to large, smooth; flowers white, many, persistent; tubers medium to large, usually rough, red-purple; eyes deep, large, eyebrows prominent; flesh white, sometimes tinged purple just beneath skin, firm; fairly mealy, white when cooked. Crop, 153 lb. 4 oz.; very little scab. Lifted August 13.

II.—Second Early Varieties.

a. Tubers kidney, white.

5. King George.—Plant dull yellow-green; haulm 2 ft. 6 in., sub-erect, more or less tinged; foliage large, flat, dull; flowers white, many, persistent; tubers flat kidney, medium, rather irregular, brownish yellow, netted; eyes and eyebrows medium; flesh white, firm; fairly mealy, whitish when cooked. Crop, 158 lb. 1 oz.; very little scab. Lifted Aug. 20. Introduced by Mr. Butler.

b. Tubers round, white.

4. Conquest.—Plant dark shining green; haulm 18 in. to 24 in., spreading, tinged; foliage large, flat, glossy; flowers white, many, dropping; tubers mostly round, medium; skin usually rough, yellowish white; eyes deep at apex, eyebrows rather conspicuous; flesh pale yellow, firm; mealy, creamy yellow when cooked. Crop, 125 lb. 13 oz.; scabby. Lifted Aug. 7. Introduced by Mr. Findlay.

6, 7, 8. Great Scot.—Plant dark green; haulm 2 ft. 6 in., erect, tinged; foliage medium, flat, more or less glossy; flowers white, many, dropping; tubers round, medium, regular; skin rough, yellowish white; eyes medium to deep, eyebrows inconspicuous; flesh pale yellow, firm; mealy, creamy yellow when cooked. Stock No. 6 was partly attacked by 'black-leg,' crop 111 lb. 8 oz.; No. 7, 145 lb.; No. 8 (38 plants), 127 lb. 13 oz., somewhat scabby. Lifted Sept. 11. Raised by Mr. A. W. McAlister.

9. Sir Douglas Haig.—Indistinguishable from 'Great Scot.' Crop, 156 lb. 15 oz. Lifted Sept. 11. Introduced by Mr. Sands.

10. Southampton Wonder.—Indistinguishable from 'Great Scot.' Crop, 141 lb. 2 oz. Lifted Sept. 11. Introduced by Messrs. Toogood.

11. The Duchess.—Plant yellowish green; haulm 2 ft., rather spreading, tinged; foliage large, flat; flowers white, many, dropping; tubers mostly flat round, medium; skin rough, yellowish white, sometimes tinged pink; eyes medium, eyebrows prominent; flesh pale yellow, firm; mealy, creamy yellow when cooked. Crop, 144 lb. 14 oz.; scabby. Lifted August 20. Introduced by Messrs. Dobbie.

12. The Ally.—Plant dull green; haulm 21 in. to 24 in., erect, green; foliage medium, flat; flowers white, few, dropping; tubers mostly flat round, large to very large, irregular; skin rough, yellowish white; eyes mostly superficial, eyebrows rather prominent; flesh pale yellow, firm; fairly mealy, creamy white when cooked. Crop, 147 lb. 15 oz.; scabby. Several plants attacked by black-leg. Lifted August 31.

III.—Maincrop or Late Varieties.

a. Tubers kidney, white.

27, 28. Langworthy.—Plant dark green; haulm 4 ft., erect, green; foliage large, flat, glossy; flowers mauve, many, dropping; tubers medium to large, fairly regular, smooth, yellowish white (sometimes slightly tinged pink); eyes superficial, eyebrows fairly conspicuous; flesh yellowish, firm; mealy, creamy yellow to white when cooked. Crop, Stock No. 27, 121 lb. 11 oz.; No. 28, 124 lb. Slightly scabby. Lifted Sept. 17. Raised by Mr. Niven.

29. What's Wanted.—Indistinguishable from 'Langworthy.' Crop (39 plants), 116 lb. 2 oz. Lifted Sept. 20.

42, 43. White City.—Plant dark green, haulm 2 ft. 6 in. to 3 ft., erect, tinged; foliage large, wrinkled, slightly glossy; flowers mauve, many, dropping; tubers flat kidney, large, rather irregular; skin mostly smooth, yellowish white (sometimes tinged pink); eyes superficial, eyebrows rather prominent; flesh pale yellow, firm; mealy, creamy white when cooked. Crop, No. 42, 99 lb. 2 oz.; No. 43, 95 lb. 5 oz.; scabby, chats very few. Lifted Sept. 17. Raised by Mr. J. Stevenson. Introduced by Messrs. Sutton.

44. St. Malo Kidney.—Plant yellowish green; haulm 2 ft. 6 in., spreading, green; foliage large, wrinkled; flowers mauve, many, dropping; tubers mostly kidney, large; skin rough, yellowish white; eyes superficial, eyebrows inconspicuous; flesh pale yellow, firm; mealy, white when cooked. Crop, 135 lb. 8 oz. Lifted Sept. 11.

23. Jeanie Deans.—Plant dull green; haulm 2 ft. 6 in. to 3 ft., spreading, tinged; foliage large, flat; flowers white, many, dropping; tubers mostly kidney, medium; skin smooth, yellowish white; eyes rather deep, and eyebrows rather prominent; flesh pale yellow, firm; close, and dirty white when cooked. Crop (18 plants), 51 lb. 5 oz. Lifted Sept. 11.

b. Tubers kidney, yellow-brown.

30, 31. Golden Wonder.—Plant dark green; haulm 4 ft., erect, very slightly tinged; foliage large, fairly smooth, glossy; flowers

mauve, many, dropping; tubers medium; skin rough, netted, buff-brown with yellow patches; eyes mostly superficial; skin sometimes very slightly tinged near eye; eyebrows prominent; flesh pale lemon, firm; mealy, yellow when cooked. Crop, Stock No. 30, 144 lb. 12 oz.; No. 31, 112 lb. 11 oz. (The latter contained some yellowish-skinned tubers, the flesh of which was white when cooked.) Lifted Sept. 26. Raised by Mr. Brown.

c. Tubers round or flat round, white or yellowish white.

13, 14. Favourite.—Plant green; haulm 3 ft., erect, tinged; foliage large, flattish; flowers white, many, dropping; tubers flat round, medium; skin smooth, yellowish white; eyes superficial, eyebrows prominent; flesh pale yellow, firm; fairly mealy, creamy white when cooked. Crop, Stock No. 13 (39 plants), 124 lb.; No. 14 (39 plants), 135 lb. 4 oz. (one rogue in each); very scabby. Lifted Sept. 10. Introduced by Messrs. Dobbie.

17. Abundance.—Plant dull green; haulm 4 ft. to 4 ft. 6 in. more or less spreading, stems many, tinged; foliage large, flattish; flowers white, many, dropping; tubers round or flat round, medium to small, irregular, almost smooth, or slightly rough, yellow-white; eyes superficial, eyebrows inconspicuous; flesh yellowish, firm; mealy, creamy white when cooked. Crop (39 plants), 146 lb. 14 oz., including 22 lb. chats. Lifted Sept. 10. Introduced by Messrs. Sutton.

19. Culdees Castle.—Very similar to 'Abundance,' but crop 114 lb. 9 oz. Lifted Sept. 17.

20. King Albert.—Haulm 3 ft. 6 in.; tubers flat round, skin of tuber slightly roughened or netted; otherwise like 'Abundance.' Crop, 147 lb. 6 oz., chats few. Lifted Sept. 17. Introduced by Mr. W. E. Sands.

21. The Provost.—Very similar to 'Abundance,' but crop 92 lb. 1 oz., rather irregular. Lifted Sept. 17.

22. The Crofter.—Haulm 3 ft., slightly tinged; otherwise similar to 'Abundance.' Crop, 135 lb. 12 oz., chats 9 lb. Lifted Sept. 10.

24. Twentieth Century.—Plant rather dark green; otherwise similar to 'Abundance.' Crop, 129 lb. 2 oz., chats few. Lifted Sept. 20.

25. The Admiral.—Haulm 4 ft., erect; flesh rather close when cooked; otherwise very similar to 'Abundance.' Crop, 81 lb. 9 oz. Lifted Sept. 10. Raised by Mr. T. Chapman. Introduced by Messrs. Dobbie.

[The foregoing Nos. 17, 19, 20, 21, 22, 24, 25, are difficult to distinguish from one another. All, after being stored a few weeks, showed traces of pink in the skin or just beneath it, not noticeable at lifting time, and all contained some smooth and some rather netted tubers, the flesh of the former being rather whiter than that of the latter.

Nos. 17, 19, 20, 21, 22, 24, developed hollows in the middle of some of the tubers, and stains in the flesh. Similar hollows and stains were present in Nos. 13 and 14. The foliage of all was attacked by Phytophthora, and some disease was present in the tubers.]

26. Burnhouse Beauty.—Plant green; haulm 4 ft., more or less spreading, stems many, green; foliage large, flat, glossy; flowers mauve, many, dropping; tubers round or flat round, small to medium; skin yellowish white (becoming tinged in store); eyes and eyebrows medium; flesh yellowish, firm; fairly mealy, white when cooked. Crop, 132 lb. 13 oz. Lifted Sept. 11. Some scab. Introduced by Messrs. Dobbie.

32, 33. Rob Roy.—Plant green; haulm 2 ft. to 2 ft. 6 in., spreading, green; foliage medium flat; flowers mauve, few, dropping; tubers mostly flat round, medium to large; skin slightly rough, yellowish white; eyes variable, eyebrows inconspicuous; flesh yellow, firm; close and creamy yellow when cooked. Crop, No. 32, 139 lb. 3 oz.; No. 33, 122 lb. 9 oz., chats few. Lifted Sept. 20. Raised by Mr. McAlister.

48. The Laird.—Plant green; haulm 3 ft., erect, very slightly tinged; foliage large, flat; flowers mauve, many, dropping; tubers flat round, medium; skin somewhat rough, yellowish white; eyes and eyebrows variable; flesh nearly white, firm; close, creamy white when cooked. Crop (39 plants), 97 lb. 11 oz. Lifted Sept. 20. Introduced by Mr. Davie.

46. Tinwald Perfection.—Plant yellowish green; haulm 21 in. to 24 in., spreading, slightly tinged; foliage medium, flat; flowers mauve, many, dropping; tubers flat round, medium to large, russeted, yellowish white; eyes superficial to medium, eyebrows more or less conspicuous; flesh light yellow, firm; close and yellow when cooked. Crop, 110 lb. 8 oz., chats few. Lifted Sept. 17. Raised by Mr. Farish.

45. Dominion.—Plant yellowish green; haulm 3 ft., erect, dark; foliage large, flat; flowers white, many, dropping; tubers flat round, medium, roughish, yellow-white (but becoming much tinged red in store); eyes superficial to medium, eyebrows fairly conspicuous; flesh yellowish, firm; fairly mealy and white when cooked. Crop, 140 lb. 7 oz., including chats 16 lb. 6 oz. Lifted Sept. 11. Introduced by Messrs. Poad.

d. Tubers round, brownish yellow.

37. Leinster Wonder.—Plant dull dark green; haulm 3 ft., erect, slightly tinged; foliage rather small, somewhat wrinkled; flowers white with orange anthers, many, persistent; tubers round, medium; skin rough, netted, sometimes pink tinged; eyes rather deep, eyebrows somewhat prominent; flesh nearly white, firm; mealy and creamy white when cooked. Crop (37 plants), 109 lb. 2 oz. Lifted Sept. 26. Introduced by Mr. W. E. Sands.

e. Tubers round or flat round, coloured.

34, 35. The Lochar.—Plant dull green; haulm 3 ft. 3 in., erect, green; foliage large, flat; flowers white, many, dropping; tubers flat round or round, of rather squarish build, small to medium, rather irregular; skin smooth, with pinkish flush and pink lenticels; eyes rather deep, eyebrows variable; flesh very pale yellow, firm; close and white when cooked. Crop, No. 34, 174 lb. 4 oz. (chats 10 lb.), lifted Sept. 17; No. 35, 152 lb. 8 oz. (chats 10 lb.), lifted Sept. 21. This was the heaviest cropper in the trial, the greater proportion of the tubers being on the small side. Raised by Mr. Farish.

36. Heather Bountiful.—A less vigorous stock, sometimes tinged in haulm, but otherwise like 'The Lochar.' Crop (39 plants), 78 lb. 10 oz. Lifted Sept. 20.

38. Kerr's Pink.—Plant grey-green; haulm 3 ft. 3 in., erect, tinged; foliage medium, somewhat wrinkled; flowers white, many, dropping; tubers flat round or round, large; skin, more or less smooth, more or less pink, especially at rose end and round eyes; eyes deep, eyebrows variable; flesh yellowish, firm; mealy, creamy white when cooked. Crop, 142 lb. 5 oz. Lifted Sept. 26.

39, 40. Irish Queen.—Plant dull green; haulm 3 ft. 3 in. to 3 ft. 6 in., erect or somewhat spreading, slightly tinged; foliage large, flat; flowers mauve, few, dropping; tubers round, medium; skin fairly smooth, pink; eyes fairly deep, eyebrows prominent; flesh nearly white, firm; close and creamy white when cooked. Crop, No. 39, 98 lb. 2 oz.; No. 40 (39 plants), 121 lb. 9 oz., scabby. Lifted Sept. 17. Introduced by Mr. W. E. Sands.

41. Shamrock.—Plant dull dark green; haulm 3 ft., erect, green; foliage rather small, wrinkled; flowers white with orange anthers, many, persistent; tubers round, large; skin more or less rough, netted, red; eyes deep, eyebrows not very prominent; flesh pale yellowish, pink just within skin, firm; white and close when cooked. Crop (39 plants), 122 lb. 14 oz. Lifted Sept. 26. Introduced by Mr. W. E. Sands.

EXPERIMENTS IN CULTIVATION OF POTATOS.

In addition to numerous variety trials of Potatos at Wisley during 1917, several series of experiments designed to ascertain the effects upon the yield of different methods of treating seed tubers were carried out.

These experiments dealt with:

I. The cutting of seed tubers (see below).
II. The effect of various dressings on the cut surface of these tubers (p. 125).
III. Greened and not-greened seed tubers with different numbers of sprouts *v.* tubers taken straight from the clamp (p. 125).
IV. Planting tubers of different sizes (p. 126).
V. The effect of planting at different distances apart (p. 127).
VI. The effect of date of planting (p. 128).

In every case precautions were taken to obviate as far as possible errors due to differences in soil. This was usually done by repeating the treatment on two or three plots. Care was also taken that every group of plants had similar exposure to that with which it was to be compared, and in other ways to make the comparison between the plots as fair as it could possibly be.

The results are set out below:

I. The Effect of Cutting Seed Tubers.

The variety used in this experiment was 'Factor.' The seed was grown at Wisley (third year) and was planted in mid-April, the rows being 27 in. apart, and the plants 18 in. apart in the rows. The plants were arranged in blocks of four rows of five plants, four blocks running across one of the garden plots. Twenty plants were grown under each treatment. The different treatments and the yields are shown in the table (p. 124).

Taking the first eight groups first, it is evident that cutting the tubers tends to reduce the total crop, for No. 1 gave a greater yield than any of the others, while No. 2, where only the extreme heel end of the tuber was sliced away, was slightly less. [There is a prevalent idea that unless the seed tuber "decays" the resulting crop is sure to be small, and this is generally true, but the cutting away of the basal part of the seed tuber is often stated to be an aid to the requisite "decay." Such cutting, however, has no influence in rendering the contents of the seed tuber available for the sprouts. In this series

of experiments the tubers all decayed normally whether cut or not, but in another planting, of 'Midlothian Early,' where the crop was very poor, none of the tubers decayed whether cut or not.]

It is clear also that the "rose end," where the greater number of eyes and usually the best developed eyes are situated, tends to give a higher yield than does the "heel end," *i.e.*, the end of the tuber bearing the tag which attached it to the old plant. This point is confirmed by comparing Nos. 9 and 10 with Nos. 11 and 12, where the same tendency is apparent. The "rose end" seems, too, to possess some advantage over the half tuber cut lengthwise, *i.e.* where "rose end" and "heel end" are both represented, for the yield of No. 7 is higher than either No. 5 or No. 6. The lower yield of Nos. 5 and 6 may be due to the increased amount of unprotected surface exposed, for the size of the surface exposed seems to have had some effect upon the yield when a long time elapsed between cutting and planting. The tubers cut lengthwise in January gave a smaller yield than those cut in the same way immediately before planting; the difference was much less when the tubers were cut crosswise and similarly treated; and merely cutting away the extreme heel end reduced the yield but little. In this series liming the cut surface, whether the cut was made at planting time or in January, seems to have reduced the yield to some extent, unless the failure of two sets in the unlimed January cut series (No. 5) is to be attributed to the cutting.

Nos. 9 to 12 were larger tubers than those used in groups Nos. 7 and 8, and gave larger yields under similar treatment. This result should be compared with those in Series IV.

	Sets.				No. of plants surviving.	Yield.			
	Size.	Cut.	Time of Cutting.	Limed or not.		Ware.	Chats.	Total.	Average.
						lb. oz.	lb. oz.	lb. oz.	lb. oz.
1	Seed	Not cut	—	—	20	50 10	2 6	53 0	2 10½
2	,,	Sliced at bottom	Planting time	Not	20	49 4	1 10	50 14	2 8¾
3	,,	Lengthwise	,,	,,	20	48 6	1 5	49 11	2 7½
4	,,	,,	,,	Limed	20	45 4	11	45 15	2 4¾
5	,,	,,	January	Not	18	34 4	1 0	35 4	2 0
6	,,	,,	,,	Limed	20	34 6	12	35 2	1 12
7	,,	Rose end	,,	,,	20	44 2	1 11	45 13	2 4¾
8	,,	Heel end	,,	,,	20	37 15	14	38 13	1 15
9	Ware	Rose end	Planting time	,,	20	49 5	1 11	51 0	2 9
10	,,	,,	January	,,	20	49 6	1 2	50 8	2 8½
11	,,	Heel end	Planting time	,,	20	42 9	1 6	43 15	2 3
12	,,	,,	January	,,	20	41 10	1 0	42 10	2 2

It may be pointed out that, where seed is scarce or expensive, cutting the sets, in spite of the reduction in yield from each plant, gives a much greater return from a given weight of seed. Thus the twenty uncut tubers gave a crop of 53 lb.; but twenty seed tubers of the same

size cut in half lengthwise at planting time to make forty plants gave 95 lb. 10 oz.; twenty of the same size cut in half lengthwise in January, of which thirty-eight halves survived, gave 71 lb.; twenty of the same size cut in half transversely to make forty plants gave 84 lb. 10 oz.

II. The Effect of Various Coverings on Cut Surfaces of Potato Tubers.

In order to test the effect of various substances which might be used for covering the surface of tubers cut for propagation purposes in order to prevent loss of moisture, &c., a number of tubers of seed size (var. 'Factor') were cut lengthwise in January and dusted with the substances mentioned in the following table. The cut tubers were planted in mid-April after sprouting, in rows 27 inches apart and 18 inches apart in the rows, and the different groups of twenty cut pieces arranged as in Series I.

Covering.	No. of plants surviving out of 20.	Weight of Crop. lb.	oz.
1. No covering	20	28	10
2. Keen's Cement	19	33	15
3. Painter's Knotting	16	21	6
4. Size	20	32	13
5. Loam	19	24	11
6. Sand	16	26	8
7. Plaster of Paris	19	38	8
8. Flowers of Sulphur	20	32	4

It seems evident that plaster of Paris is one of the best materials for checking loss of moisture where tubers are cut before planting, while Keen's Cement, Size, and Flowers of Sulphur follow. As might be expected, loam and sand are of little use, but Painter's Knotting, strangely enough, seems actually detrimental, for, while four of the twenty halves died, the surviving sixteen gave a smaller average crop than any of the others.

III. Effect of Greening and Number of Sprouts on Seed Potatos on Yield.

The importance of sprouting potatos before planting them is now almost universally recognized, although there still prevails an erroneous idea that sprouting is necessary only in the case of early varieties. The increase in yield of all varieties through sprouting has been found to average two tons to the acre, and it is therefore manifest that sprouting before planting ought not on any account to be neglected. In this experiment the results of sprouting in full light show only a negligible advantage over those obtained by sprouting in the dark; but it is to be observed that the short, sturdy sprouts formed on tubers

sprouted in the light are less liable to damage during planting than are the more slender, delicate shoots produced when tubers are sprouted in the dark.

At the same time the yield of tubers sprouted in trays, whether in the light or in darkness, is in remarkable contrast with that of tubers of the same stock kept in the clamp and urged to the production of spindly sprouts exhausting the tuber by the conditions there.

Group.	Treatment.	No. of sprouts left when planting.	Yield.		
			Ware and Seed.	Chats.	Total.
			lb. oz.	lb. oz.	lb. oz.
1	Greened and sprouted	1	41 13	0 12	42 9
2	" "	2	49 2	0 14	50 0
3	" "	none	31 6	1 14	33 4
4	" "	all	48 9	1 14	50 7
5	Sprouted in dark	1	44 1	0 11	44 12
6	" "	2	49 4	1 0	50 4
7	" "	none	37 7	1 4	38 11
8	" "	all	41 15	0 11	42 10
9	Exhausted and shrivelled in clamp	1	37 13	1 1	38 14
10	" "	2	41 6	1 0	42 6
11	" "	none	23 3	2 3	25 6
12	" "	all	34 2	2 14	37 0

The variety used was 'Factor,' as in Series I. and II.; the tubers were of seed size; and they were planted as described in the first two series. Twenty plants were grown in each group. The superiority of the seed sprouted in trays over that allowed to sprout and exhaust itself in the clamp is plain from the foregoing table, for the average yield of the tray-sprouted seed was 2 lb. 2½ oz. of useful produce, while that from the clamp-exhausted tubers was only 1 lb. 10 oz., an advantage of over ½ lb. a plant in favour of tray-sprouting.

It is also evident that in all cases it was better to leave one sprout than to rub all off at planting time, and better still to leave two sprouts than one. To leave two sprouts seems also better than to leave all produced; the advantage is shown both in total yield and in the weight of chats produced, for usually more chats were produced where all sprouts were left than where all were removed but one or two.

The reduction in crop where all the sprouts are removed is doubtless due in part to partial exhaustion of food material, and in part to delay in starting growth and the consequent shorter growing period. The latter point is well illustrated in Series VI. of these experiments.

IV. Effect of Size of Seed on Tuber Yield.

Another series of experiments throws some light on the reason of the low yields from exhausted tubers seen in Series III. The small tubers of one ounce gave a markedly smaller yield than those of two

ounces or over. 'Factor' was used in this series, the seed tubers being taken from the same stock as those used in the first three series of experiments. The distance apart was the same as in the foregoing, and twenty tubers were planted in a row. There were three groups, in one the seed tubers weighed approximately one ounce each, in the second two ounces, and in the third three ounces, and each group was repeated four times, so that eighty seed tubers of each kind were planted. The planting was done in mid-April, and the plants were lifted and weighed on September 3 after they had died down.

Size of Tuber.	Yield.		
	Ware and Seed.	Chats.	Total.
	lb. oz.	lb. oz.	lb. oz.
1. Small, about 1oz. . . .	145 14	5 1	150 15
2. Medium, about 2 oz. . .	175 10	5 0	180 10
3. Larger, about 3 oz. . .	183 8	5 6	188 14

The yield of the medium and larger tubers, of about the size usually regarded as "seed size," was markedly greater than that of the small tubers, and the chats were somewhat less in proportion to the yield. A striking thing, however, which is not brought out in the table, but which is evident on comparison of the weights of the individual plant-yields, is the tendency of the small tubers to produce a great proportion of plants giving only a small yield and a small proportion only giving a larger yield than the average. The contrast in this direction with the yield of those of a larger size is very marked.

V. Effect of Spacing on Yield.

An endeavour was made to ascertain the effect of the amount of space available for the development of the individual plant upon the yield both of the individual and of equal plots of land occupied by the differently spaced plants. The variety 'Arran Chief' was used in this experiment, the seed having been grown at Wisley in 1916. As usual, the seed was sprouted before planting. The crop was lifted after the plants died down in September 1917. The results are shown in the following table, where each space represents an area of one square rod; the top line in each space shows the distance apart of the rows and the plants in the rows on the plot in inches, and the area occupied by each plant in square feet; the first row of figures shows the yield of ware and seed, the second the weight of chats, and the third the total yield from a plot of one square rod; and the last line shows the average weight of produce from each root. The exposure of all the plants on each plot was the same; failures in the rows have been allowed for in arriving at the totals and averages, and the totals given are averages of duplicate series.

Plot	Spacing		Ware and seed lb.	oz.	Chats lb.	oz.	Total lb.	oz.	Average plant lb.	oz.
1	24" × 12" = 2 sq. ft.		227	12	28	9	256	5	1	14½
2	24" × 15" = 2½ sq. ft.		199	1	22	11	221	12	2	1
3	24" × 18" = 3 sq. ft.		184	8	15	11	200	3	2	7
4	30" × 12" = 2½ sq. ft.		187	11	23	0	210	11	2	0
5	30" × 15" = 3⅛ sq. ft.		198	1	21	13	219	14	2	9
6	30" × 18" = 3¾ sq. ft.		202	6	17	0	219	6	3	4
7	36" × 12" = 3 sq. ft.		181	13	20	5	202	2	2	4
8	36" × 15" = 3¾ sq. ft.		172	2	12	3	184	5	2	10
9	36" × 18" = 4½ sq. ft.		164	0	15	11	179	11	3	4

It will be seen that, within the limits of spacing used in this series of experiments, two points stand out quite clearly:

1. The greater the space given to the individual plant the greater the yield of that individual is likely to be.
2. The greater the number of plants on a given area the greater the yield from that area will be.

It follows that in order to produce the greatest yield from a given area, planting of potatos must be somewhat close rather than wide (*i.e.* within the limits shown by this experiment); but if it is desired to raise a large quantity from a small number of seed-tubers the tubers must be planted far apart.

VI. Effect of Time of Planting on Yield.

Sprouted seed tubers of approximately equal size of the same stock of the variety 'Windsor Castle,' grown at Wisley in 1916, were planted on five different dates, viz. April 4, April 16, May 1, May 15, June 1 respectively. They were planted in rows 2 feet 6 inches apart and 18 inches apart in the rows, and were grouped in sets of sixty plants, twenty in a row, each group being duplicated, so that

120 tubers were planted on each date. The yields were as follows. The plants were lifted as they died down:—

Planted.	Lifted.	Yield.		
		Ware and Seed.	Chats.	Total.
		lb. oz.	lb. oz.	lb. oz.
1. April 4	August 31	262 12	9 11	272 7
2. „ 16	„ 31	274 5	9 3	283 8
3. May 1	September 3	274 1	11 15	286 0
4. „ 15	„ 20	229 5	11 13	241 2
5. June 1	„ 20	172 2	14 0	186 2

There is little difference in the yields of the first three plantings, no doubt because the weather up to the middle of April did not encourage growth, while after that the plants made steady progress without the usual set-backs due to late frosts and the like; but the late plantings, especially the June one, led to serious reductions in the crop, moreover the proportion of chats was markedly greater in both late plantings, but especially in the June-planted set. April seems the best month to plant at Wisley, and though seasons may make some difference, for all but quite early varieties planted in the most favourable positions probably from the middle to the end of the month is best if the seed is previously sprouted.

A STANDARDIZED POTATO TRIAL.

By W. CUTHBERTSON, V.M.H.

IN the autumn of 1916 I decided to carry out in 1917, if possible, a series of Potato Trials in different parts of the country on a better basis than that of any former trials. For a long time I had recognized that the Royal Horticultural Society's and all other Potato Trials had an unsatisfactory basis, in so much that the seed tubers used came from all parts of the country—from Devonshire to Aberdeenshire and from Ireland.

At the Potato Conference at Ormskirk, under the auspices of the Board of Agriculture and the Lancashire Farmers' Association, in October 1916, I explained my scheme, and offered collections to those willing to assist. In the beginning of December I sent the undernoted letter to the following nine gentlemen, without whose help the work could never have been done, and to whom I feel deeply indebted:

Professor Seton, The University, Leeds.
Dr. Keeble, F.R.S., Director, R.H.S., Wisley.
Professor Barker, University of Bristol.
Mr. W. D. Davidson, Dept. of Agriculture for Ireland.
Mr. W. Mauger (Mauger & Son), Guernsey.
Mr. P. C. M. Veitch (Robert Veitch & Son), Exeter.
Mr. E. J. Deal (Johnsons Ltd.), Boston, Lincolnshire.
Mr. Sowman, Lancashire C.C., Hutton.
Mr. G. T. Malthouse, Shropshire C.C., Shrewsbury.

Mr. James Bone (Dobbie & Co.), Edinburgh, had charge of the tenth lot.

POTATO TRIALS.

"DEAR SIR,—With reference to the offer I made at the Ormskirk Conference, I now beg to say that I am in a position to send you twenty varieties of potatos, twenty sets of each, if you think you can find time and facilities to grow them next season. The seed has all been standardized by having all been grown in a market garden near Edinburgh last season. Previous to that, of course, it was all Scotch-grown stuff, but grown in different districts. I suggest that the twenty varieties should be grown in lines 3 feet apart and the sets placed 18 inches apart. This distance you may consider rather wide for early varieties, but it will enable you to better observe the characters of the plants. I would further suggest that the ground should be dug one spit deep now and manured with farmyard manure at the rate of 20 tons per acre. The question of artificial manure I am asking

Professor Seton's opinion regarding. We should all apply the same dressing in the drills when planting in spring.

"Will you kindly let me know if you are prepared to receive the 400 tubers now and box them? If all can do this it would add another point of uniformity to the Trials.

"Yours faithfully,

"W. CUTHBERTSON."

In February I wrote as follows to each:

"*Manuring.*—Professor Seton (with whom I discussed the matter of artificials last week) and I decided that all should have a moderate dressing in the drills at planting time if potash could be got. I have secured some potash (45 per cent.), and I hope to send you later a little bag of manure worked out on the basis of 1 cwt. sulphate of ammonia, 4 cwt. superphosphate (26 per cent.), and 1 cwt. potash per acre. Each trial plot should extend to about 200 square yards. The produce will become the property of the experimenter.

"Should any of the tubers sent you have suffered by the recent frost, please let me know and I will repeat them if possible.

"Yours,

"W. CUTHBERTSON."

On March 19, 1917, I wrote to each:

"DEAR SIR,—I have sent you per passenger train, carriage paid, 35 lb. artificial manure, prepared on the basis of a 6 cwt. dressing per acre (1 cwt. sulphate of ammonia, 1 cwt. sulphate of potash, 4 cwt. 26 per cent. superphosphate). It is hoped all the potatos will be planted between now and Easter, and, as suggested, in lines 3 feet apart and 18 inches between the sets. The precaution of planting one or two rows at each end of the trial plot with a variety which is not in the trial will be evident, and will, no doubt, be done in every case.

"Yours,

"W. CUTHBERTSON."

The tables on pages 132-4 give the returns.

NATURE OF SOILS ETC.

The following particulars furnished by the growers will indicate the nature of the soils on which the potatos were grown. The localities are given in the same order as in the table:

1. Guernsey. The soil is of a very sandy nature and has carried bulbs for many years. It was reclaimed from the sea in 1812, and up to twenty-five years ago produced little. When it came into our possession it was drained and many thousands of loads of sandy road sweepings were added. It lies eight feet above sea-level.

2. Edinburgh. Free loam on market garden land at Joppa, four miles east of Edinburgh.

3. Bristol. Sandy to medium loam with a tendency to stickiness on surface after heavy rain, caking on drying, at Long Ashton, four miles west of Bristol, 160 feet above sea level. Followed nursery apples.

YIELD OF POTATOS IN LB.

—	Guernsey.	Edinburgh.	Bristol.	Leeds.	Wisley.	Boston, Lincs.	Co. Down, Ireland.	Exeter.	Preston.	Salop.	Total.
EARLY VARIETIES.											
Sir J. Llewelyn . .	71	72	88	89	75	76	81	63	65	66	746
*Snowdrop (Resistant)	60	61	64	58	59	75	72	58	53	54	614
Sharpe's Express .	55	63	66	64	58	77	66	48	54	55	606
Witch Hill . .	65	62	56	59	55	75	66	50	53	44	585
Midlothian Early .	64	47	22	49	56	34	46	23	49	38	428
SECOND EARLY VARIETIES.											
British Queen . .	90	87	87	80	87	94	79	78	54	63	799
*Great Scot . .	80	94	93	69	46	42	54	36	44	35	593
*Secundus . .	75	45	92	50	42	59	46	76	29	53	567
*Burnhouse Beauty .	60	60	43	55	56	57	56	48	51	42	528
*Dobbie's Favourite .	73	75	31	65	61	26	53	29	47	19	479
MAIN CROP VARIETIES.											
Dobbie's Prolific .	115	79	65	54	74	66	63	61	53	38	668
*The Provost . .	64	79	90	52	71	70	52	70	48	54	650
The Factor . .	80	77	51	68	79	53	77	56	74	28	643
King Edward . .	48	68	88	71	67	80	61	50	30	38	601
*The Admiral . .	71	48	83	57	50	68	29	79	44	47	576
*Kerr's Pink . .	77	85	50	67	66	52	51	47	43	31	569
Arran Chief . .	45	54	40	59	61	52	55	77	55	34	532
Isis	59	65	55	59	52	55	39	44	47	23	498
*White City . .	36	56	46	58	62	56	44	56	44	30	488
*The Lochar . .	52	60	45	55	41	32	44	46	39	22	436
Total . .	1340	1337	1255	1238	1218	1199	1134	1095	976	814	11,606

* Resistant to wart disease.

4. Leeds. Medium loam soil overlying coal measure sandstone, at Garforth Manor Farm, eight miles east of Leeds.

5. Wisley. Light sandy loam at junction of Bagshot sands and London clay, at R.H.S. Gardens, Wisley, Ripley, Surrey, 120 feet above sea level.

6. Boston, Lincs. Light top soil on heavy bottom.

7. Co. Down. Reclaimed mountain land which had previously grown nothing but bracken. A gravelly loam at Burrenreagh, Castlewellan; soil as a rule very suitable for potato-growing.

8. Exeter. Dark stiff loam with a clay and gravel subsoil, at Cleve Nursery, Exwick, growing young conifers for past six years.

9. Preston. A hazel loam one year from pasture at Council Farm, Hutton, nr. Preston, 82 feet above sea level.

10. Shropshire. A medium loam containing a fair quantity of flinty stones. Old pasture bastard trenched early in 1917 at Oswestry.

The following table shows the weight of seed of each variety sent to each station:

WEIGHT OF "SETS" SENT TO EACH STATION IN LB.

—	Guernsey.	Edinburgh.	Bristol.	Leeds.	Wisley.	Boston, Lincs.	Co. Down, I.	Exeter.	Preston.	Salop.	Total.
EARLY VARIETIES.											
Sir J. Llewelyn .	$2\frac{1}{4}$	$2\frac{1}{8}$	$2\frac{1}{2}$	$2\frac{1}{8}$	$2\frac{1}{8}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{5}{8}$	$23\frac{1}{8}$
Snowdrop (Resistant)	$2\frac{5}{8}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{5}{8}$	$2\frac{3}{8}$	$2\frac{1}{2}$	$24\frac{3}{8}$
Sharpe's Express .	$2\frac{5}{8}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$25\frac{1}{2}$
Witch Hill . .	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{7}{8}$	$2\frac{7}{8}$	$2\frac{1}{2}$	$2\frac{7}{8}$	$2\frac{1}{2}$	$2\frac{7}{8}$	$2\frac{5}{8}$	27
Midlothian Early .	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{7}{8}$	$2\frac{5}{8}$	3	$2\frac{1}{2}$	$2\frac{7}{8}$	$27\frac{3}{8}$
SECOND EARLY VARIETIES.											
British Queen .	$2\frac{5}{8}$	$2\frac{7}{8}$	$2\frac{1}{2}$	$2\frac{7}{8}$	$2\frac{7}{8}$	$2\frac{5}{8}$	$2\frac{7}{8}$	$2\frac{1}{2}$	3	$2\frac{5}{8}$	$27\frac{3}{8}$
Great Scot . .	$3\frac{3}{4}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3	$2\frac{1}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{4}$	$29\frac{1}{2}$
Secundus . .	$2\frac{5}{8}$	$3\frac{1}{2}$	$2\frac{5}{8}$	$3\frac{3}{8}$	$3\frac{5}{8}$	$2\frac{5}{8}$	$3\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{7}{8}$	$2\frac{5}{8}$	$31\frac{1}{8}$
Burnhouse Beauty .	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{3}{8}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{3}{8}$	$2\frac{3}{4}$	$26\frac{1}{2}$
Dobbie's Favourite.	$2\frac{7}{8}$	3	$2\frac{7}{8}$	$2\frac{5}{8}$	$3\frac{1}{8}$	3	$2\frac{7}{8}$	$2\frac{7}{8}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$28\frac{5}{8}$
MAIN CROP VARIETIES.											
Dobbie's Prolific .	$2\frac{1}{4}$	3	$3\frac{1}{4}$	$2\frac{7}{8}$	$3\frac{1}{8}$	$3\frac{3}{8}$	$2\frac{7}{8}$	3	$2\frac{7}{8}$	3	$29\frac{5}{8}$
The Provost . .	$2\frac{5}{8}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$25\frac{3}{4}$
The Factor . .	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{5}{8}$	3	$2\frac{7}{8}$	$2\frac{5}{8}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$27\frac{1}{4}$
King Edward. .	$2\frac{7}{8}$	3	$2\frac{1}{2}$	$3\frac{3}{8}$	$3\frac{1}{4}$	$2\frac{3}{8}$	$3\frac{3}{8}$	$2\frac{3}{4}$	$3\frac{1}{4}$	$2\frac{1}{4}$	29
The Admiral . .	$2\frac{7}{8}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{5}{8}$	$3\frac{1}{8}$	$2\frac{7}{8}$	$2\frac{7}{8}$	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{7}{8}$	28
Kerr's Pink . .	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{5}{8}$	$2\frac{7}{8}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$26\frac{1}{4}$
Arran Chief . .	$3\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{7}{8}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{7}{8}$	$2\frac{7}{8}$	$2\frac{1}{2}$	$27\frac{3}{8}$
Isis . . .	$2\frac{5}{8}$	$2\frac{1}{8}$	$2\frac{5}{8}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{5}{8}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$25\frac{1}{8}$
White City . .	$3\frac{1}{2}$	3	$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{1}{8}$	$3\frac{1}{4}$	$3\frac{1}{8}$	$3\frac{3}{8}$	3	$3\frac{1}{4}$	$32\frac{3}{8}$
The Lochar . .	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$25\frac{1}{8}$
											$546\frac{3}{8}$

I have a lot of detailed information from the different growers, but considerations of space prevent my giving it. The wet August adversely affected the crop of the late varieties, and so did the dry July, while the dryness of July helped the early varieties to finish off well. Mr. Sowman reports that during the growing period the plants were closely inspected. No variations in foliage of each individual variety could be detected to warrant the marking of any as rogues. Disease was more prevalent in the south than in the north. All crops were weighed as lifted. Both Mr. Veitch of Exeter and Professor Barker of Bristol speak of rust attacking 'Midlothian Early' badly. While there was no rust on any of the varieties in the

lot at Edinburgh, it was rather prevalent in the field crops in Mid and East Lothian in 1917. It is most injurious to the crop, and if it occurs badly again will demand investigation. Many of the varieties gave an average of 4 lb. a root, which at 3 feet × 18 inches represents a crop of 18 tons an acre.

Professor Seton, discussing future trials, says: "It becomes a question as to the relative merits of a repetition of the same experiment or a test as you suggest between new varieties and the older varieties that have done best this year." Professor Seton favours a repetition of the 1917 trial because "one season's results are not sufficient to determine which are the best." In these times of labour shortage and so many calls on one's time I feel loth to ask busy men to undertake extra work, but most, I think, will agree that we should do something in 1918.

The following table shows the total crop at each of the stations and the aggregate yield of each of the varieties at the ten stations:

Total crop at the different stations.		Varieties arranged in order of aggregate weight at ten stations.	
	Lb.		Lb.
Guernsey	1,340	1. British Queen	799
Edinburgh	1,337	2. Sir J. Llewelyn	746
Bristol	1,255	3. Dobbie's Prolific	668
Leeds	1,238	4. The Provost	650
Wisley	1,218	5. The Factor	643
Boston, Lincs.	1,199	6. Snowdrop (Resistant)	614
Co. Down (I.)	1,134	7. Sharpe's Express	606
Exeter	1,095	8. King Edward	601
Preston	976	9. Great Scot	593
Salop	814	10. Witch Hill	585
		11. The Admiral	576
	11,606	12. Kerr's Pink	569
		13. Secundus	567
Total weight of seed planted at the		14. Arran Chief	532
different stations	546½	15. Burnhouse Beauty	528
Ratio of increase	21	16. Isis	498
		17. White City	488
		18. Dobbie's Favourite	479
		19. The Lochar	436
		20. Midlothian Early	428
			11,606

MAINCROP AND LATE POTATOS AT WISLEY, 1916.

NINETY-SEVEN stocks of Potatos were grown in the trials of late and maincrop varieties at Wisley 1916, including several varieties that had received Awards in earlier years for comparison with newer ones. Twenty tubers of each were planted on April 25 in rows 3 feet apart and 18 inches apart in the rows in well-dug ground heavily manured for the previous cabbage crop. The sets had been sprouted before planting. Almost all the stocks made good growth, and in many cases excellent yields were obtained. The cultivation was under the charge of the Superintendent, Mr. S. T. Wright, and Mr. J. Wilson.

The soil of the Wisley Garden is well suited to almost all varieties of Potato, the only exceptions being those few varieties which are best suited by a stiff clayey soil. In comparing the yields in the records given below, it must be remembered that the quality of the seed has a great deal to do with the yield, and one of the chief factors governing seed-quality is the place in which the seed is grown. Indeed, the difference in yield between different stocks of the same variety from seed of the same size, treated in all respects in the same way and grown under precisely similar conditions, may be greater than that between a normally poor-yielding variety and a heavy-yielding one. This is well brought out in the present trial by comparing the yields of a variety of which two or more stocks from different districts were included, *e.g.* 'Arran Chief.' Of these there were three English stocks, one from the West of England giving 71 lb., one from Bucks giving 61 lb., and one from another locality giving 48 lb. Three came from Scotland giving 79 lb., 78 lb., and 76 lb. respectively, and one from Ireland giving 76 lb. The same kind of thing is seen by comparing the yields given by the two stocks of the Factor (Nos. 82 and 83) where the seed grown in Bucks gave only 58 lb., while that from Scotland gave 89 lb. The superiority of the Scotch and Irish seed over most English seed is unmistakable, and while there are undoubtedly other factors at work which render the seed better or less good, and while doubtless also some districts of Scotland and Ireland are better for seed-potato growing than others, the fact that the seed used in this trial came from different districts prevents any exact comparison of the power of cropping being made between all the varieties included. The weight of crop given therefore shows only what may reasonably be expected from the varieties when grown from seed produced in the districts from which those grown in this trial came. Scotch-grown varieties may usually be safely compared with Scotch-grown and so on.

The Fruit and Vegetable Committee examined the trial when the

potatos were lifted on September 5, 1916, and made the following recommendations for awards:

Highly Commended (**XXX**).

93. Donside Defiance, sent by Mr. David Cook.

88. King Edward, sent by Messrs. Dobbie.

76. Rob Roy, sent by Messrs. R. Veitch.

Commended (**XX**).

18. Arran Chief, sent by Messrs. Dobbie (**A.M.** 1915; Messrs. R. Veitch).

6. Cropper, sent by Mr. Anketell-Jones.

58. Drumwhindle, sent by Mr. Lewis Gavin.

89. Irish Chieftain, sent by Lissadell.

74. Langworthy, sent by Messrs. Dobbie.

30. Prolific (Dobbie's), sent by Messrs. Dobbie.

42. Superlative, sent by Messrs. Sutton.

10. The Chapman, sent by Messrs. Dobbie.

83. The Factor, sent by Messrs. Dobbie (**F.C.C.** 1905; Messrs. Dobbie).

8. The Provost, sent by Messrs. Dobbie (**A.M.** 1907; Messrs. Dobbie).

65. White City, sent by Messrs. Sutton.

The following varieties which had previously obtained awards were included in the Trial:—18–23, Arran Chief (**A.M.** 1915); 38, Balgownie Seedling (**A.M.** 1911); 25, British Champion (**A.M.** 1908); 56, British Hero (**A.M.** 1905); 26, Dalhousie (**A.M.** 1905); 50, Devanha Seedling (**A.M.** 1908); 30, Dobbie's Prolific (**A.M.** 1911); 61, Duchess of Cornwall (**A.M.** 1905); 49, Dumfries Model (**A.M.** 1900); 60, Ellington's Prolific (**A.M.** 1901); 51, Erin's Queen (**A.M.** 1911); 13, 14, Great Scot (**A.M.** 1911); 52, Longkeeper (**A.M.** 1907); 59, Reading Giant (**F.C.C.** 1892); 82, 83, The Factor (**F.C.C.** 1905); 8, The Provost (**A.M.** 1907); 53, Toogood's Tremendous (**A.M.** 1911).

It will be noticed that only three of these were among those selected by the Committee in this Trial.

VARIETIES IN THE TRIAL.

NOTE.—The description will be found below in the section indicated by the letter following the name.

*1. Mauve Queen (*e*).
2. Kerr's Pink (*e*).
3. King of the Russets (*e*).
4., 5. The Lochar (*e*).
6. The Colleen (not true).
7. The Diamond (*d*).
8. The Provost (*d*).
9. Burnhouse Beauty (*d*).
10. The Chapman (*d*).
11. Isis (*d*).
12. Patagonian (*d*).
13., 14. Great Scot (*d*).
15. Burnhouse Beauty (*d*).
16. Culdees Castle (*d*).
17. Satisfaction (*d*).
18., 19., 20., 20A., 21., 22., 23. Arran Chief (*d*).

* See footnote, page 107.

24. Snowball (*d*).
25. British Champion (*d*).
26. Dalhousie (*d*).
27. Scottish Farmer (*d*).
28. Gordon Castle (*d*).
29. Table King (*a*).
30. Prolific (*d*).
31. King Albert (*d*).
32. Liberty (*d*).
33. Leinster Wonder.
34. Stourbridge Glory (*d*).
35. Industry (*d*).
36. Chieftain (*a*).
37. Prosperity (*e*).
38. Balgownie Seedling (*d*).
39. Irish Hero (*d*).
40. Sir Edward Carson (*d*).
41. Abundance (*d*).
42. Superlative (*d*).
43.* Hero King.
44. The Crofter (*d*).
45.* St. Giles.
46. The Admiral (*d*).
47. Vitality (*a*).
48. Royalty (*d*).
49. Dumfries Model (*d*).
50. Devanha Seedling (*d*).
51. Erin's Queen (*a*).
52. Longkeeper (*d*).
53. Tremendous (*d*).
54. Jones's Cropper (*d*).
55.* Ideal.
56. British Hero (*a*).
57. Red King (*c*).
58. Drumwhindle (*d*).
59. Reading Giant (*a*).
60. Prolific (Ellington's) (*a*).
61. Duchess of Cornwall (*d*).
62. Maincrop (*a*).
63. Goldfinder (*d*).
64. Mainstay (*a*).
65.
66. White City (*a*).
67.
68. Provider (not true).
69. Reliance (*a*).
70. Dover Castle (*a*).
71.
72. Golden Wonder (*b*).
73.
74.
75. Langworthy (*a*).
76. Rob Roy (*a*).
77. St. Andrews (*a*).
78. St. Cuthberts (*a*).
79. Golden Wonder (*b*).
80.
81. Up-to-Date (*d*).
82.
83. The Factor (*d*).
84. Mighty Atom (*a*).
85.* Sunbeam.
86. Defiance (*a*).
87.
88. King Edward VII. (*c*).
89. Irish Chieftain (*a*).
90. Leader (*c*).
91.
92. Cardinal (*c*).
93. Donside Defiance (*d*).
94.* Silver City.
95. Dargavel (*d*).
96. Scottish Farmer (*d*).

DESCRIPTIONS.

An endeavour has been made to group the varieties most nearly allied close together. Thus, very closely allied to 'Abundance' (No. 41) are Nos. 7, 'The Diamond'; 8, 'The Provost'; 12, 'Patagonian'; 16, 'Culdees Castle'; 31, 'King Albert'; 44, 'The Crofter'; and 46, 'The Admiral.' These are therefore grouped together (see also p. 120). Like them in most of its characters, but quite distinct in the colour of its flowers, is 'Burnhouse Beauty' (Nos. 9 and 15), and this is therefore placed near to the Abundance Group, but with spaces and rows of asterisks separating it from them and from the group which follows, and so on. The grouping adopted is at present purely tentative, but it is hoped to develop this method of classifying potatos further as opportunity occurs. We wish to place on record our thanks to Messrs. Bone, Lasham, and Snell in connexion with this work.

a. Tubers Kidney, White or Yellow.

59. Reading Giant (Fidler).—Plant dull green; haulm small, erect, green; foliage medium, wrinkled; flowers drop in bud; tubers

* These varieties appear to be earlier than maincrop varieties and are therefore omitted from the descriptions below.

kidney, medium to large; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 48 lb.

60. Ellington's Prolific (Ellington).—Characters as in 'Reading Giant,' but haulm tinged and more spreading. Crop, 49 lb. Not to be confused with Dobbie's 'Prolific,' No. 30.

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69. Reliance (Sutton).—Plant dark green, mottled yellow; haulm of medium size, spreading, slightly tinged; foliage medium, glossy, wrinkled; flowers many, white, persistent; tubers kidney, medium to large, smooth; eyes rather deep; eyebrows somewhat prominent; flesh white. Crop, 80 lb. (Ayrshire seed). Raised by Mr. J. Clark. Introduced by Messrs. Sutton, 1897.

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62. Maincrop (Carter).—Plant grey-green, mottled yellow; haulm of medium height, erect, green; foliage medium, wrinkled; flowers dropping in bud; tubers kidney, of medium size, smooth; eyes shallow; eyebrows rather prominent; flesh yellowish white. Crop, 62 lb. (N. Scotland seed).

74, 75. Langworthy (Dobbie, Simpson), No. 74, **XX** Sept. 5, 1916.—Plant yellowish green; haulm vigorous, erect, green; foliage medium, wrinkled; flowers mauve, tipped white, dropping; tubers kidney, medium size, smooth; eyes of medium depth; eyebrows rather conspicuous; flesh white. Crop, 69 lb. (East Lothian seed); 72 lb. (Dumfries seed). Raised by Mr. Niven.

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76 Rob Roy (R. Veitch), **XXX** Sept. 5, 1916.—Plant dark green; haulm vigorous, spreading, tinged; foliage large, more or less wrinkled; flowers mauve, whitish tipped with rose-purple streaks, dropping; tubers kidney, of medium size, smooth; eyes superficial, few; eyebrows fairly conspicuous; flesh white. Crop, 107 lb. (Scotch seed). Raised by Mr. McAlister.

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77. St. Andrews (*Dobbie*).—Plant yellowish green; haulm fairly vigorous, erect, some tinged; foliage medium, wrinkled, some curled; flowers white, some dropping; tubers medium to large, smooth; eyes superficial; eyebrows fairly conspicuous; flesh white. Crop, 42 lb. (Scotch seed). Raised by Messrs. Dobbie.

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78. St. Cuthberts (Dobbie).—Plant dark dull green; haulm vigorous, tinged, erect; foliage large, flat, somewhat glossy; flowers many, purple-streaked, semi-double, persistent; tubers kidney, medium to large, smooth; eyes shallow; eyebrows rather prominent; flesh yellowish. Crop, 86 lb. (Midlothian seed). Raised and introduced by Messrs. Dobbie, 'Snowball' × 'Myatt's Ashleaf.'

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89. Irish Chieftain (Lissadell), **XX** Sept. 5, 1916.—Plant grey green; haulm vigorous, erect, tinged; foliage large, flat; flowers many, pale mauve, tipped white, persistent; tubers pebble, medium, smooth

eyes rather deep; eyebrows prominent; flesh white. Crop, 82 lb. (Irish seed). Introduced by Lissadell; raised by Mr. McKenna of Manorhamilton, Co. Leitrim, and said to be a cross between 'Beauty of Hebron' and *Solanum Commersonii.*

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70. Dover Castle (Sutton).—Plant dull green; haulm of medium height, spreading, slightly tinged; foliage small, flat; flowers many, dropping without opening; tubers kidney or pebble, of medium size, smooth; eyes shallow; eyebrows inconspicuous; flesh lemon. Crop, 76 lb. (Perthshire seed). Raised by Rev. A. Paton. Introduced by Messrs. Sutton, 1913.

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47. Vitality (Martineau).—Plant grey-green; haulm of medium height, erect, green; foliage small, wrinkled or curled; flowers many, white, dropping; tubers pebble or kidney, medium, smooth; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 56 lb. (Berks seed).

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36. Chieftain (Webb).—Plant dull green; haulm of medium size, erect, more or less tinged; foliage medium, more or less wrinkled; flowers many, white, dropping; tubers, kidney and pebble, of medium size, rough; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 41 lb. (Kidderminster seed). Introduced by Messrs. Webb.

65, 66, 67. White City (Sutton, Simpson, Sydenham), No. 65, **XX** Sept. 5, 1916.—Flowers persistent, mauve, white-tipped; eyebrows somewhat more prominent; other characters as in 'Chieftain.' Crop, 74 lb. (Ayrshire seed); 77 lb. (Dumfries seed); 57 lb. (Lincolnshire seed). Raised by Mr. J. Stevenson. Introduced by Messrs. Sutton, 1909.

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29. Table King (Webb).—Plant dark green; haulm medium, erect, green; foliage medium, wrinkled; flowers few, persistent, white; tubers pebble, rough-skinned, medium to large; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop 74 lb. (Dumfries seed). Introduced by Messrs. Webb.

64. Mainstay (Carter).—Plant light green; haulm medium, spreading, green; foliage large, wrinkled; flowers few, persistent, white; tubers pebble and kidney, more or less rough, medium in size; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 59 lb. (Hertfordshire seed). Introduced by Messrs. Carter.

84. Mighty Atom (Barr).—Haulm tinged; foliage medium; flowers dropping, creamy white; tubers pebble, smooth; other characters as 'Mainstay.' Crop, 44 lb. (Lincolnshire seed). Introduced by Messrs. Marsh.

86. Defiance (Barr).—Flowers many, white, persistent; tubers pebble and kidney, more or less rough-skinned, otherwise like 'Mighty Atom.' Crop, 43 lb. (Lincolnshire seed). Raised by Mr. Butler. Introduced by Messrs. Marsh.

51. Erin's Queen (Sands).—Plant dark green; haulm fairly vigorous, erect to spreading, green; foliage medium, flattish; flowers few, dropping, unopened; tubers pebble and kidney, smooth; eyes rather prominent, few; eyebrows fairly conspicuous; flesh white. Crop 44 lb. (Irish seed).

b. Tubers Kidney, Brown.

71, 72, 73, 79. Golden Wonder (Barr, Dobbie, Simpson, Scarlett).—Plant dark green; haulm vigorous, erect, green; foliage medium, wrinkled; flowers many, mauve, white tipped, dropping; tubers kidney, brown, netted; eyes shallow; eyebrows rather prominent; flesh more or less yellowish white. Crop, 51 lb. (Buckinghamshire seed); 65 lb. (East Lothian seed); 78 lb. (Dumfries seed); 63 lb. (Scotch seed). Raised by Mr. Brown.

c. Tubers Kidney, Coloured.

87, 88. King Edward VII. (Barr, Dobbie), **XXX** Sept. 5, 1916.—Plant dark green; haulm vigorous, erect, tinged; foliage medium, wrinkled; flowers drop in bud; tubers white flushed, red round eyes, pebble, of medium size, smooth; eyes shallow; eyebrows rather prominent; flesh yellowish white. Crop, 63 lb. (Lincolnshire seed); 71 lb. Midlothian seed).

57. Red King (W. Robinson).—Characters as in King Edward VII., but tubers red all over. Crop, 52 lb. (Lancashire seed). A red sport from 'King Edward,' introduced by Mr. W. Robinson.

Note.—Through Mr. Cuthbertson's kindness we were able in 1917 to grow plants of each of these two forms from two different localities near Edinburgh, the crops produced confirming the comparative cropping powers as indicated by the figures given above. The crops were as follows:

		Locality I.	Locality II.
Light type (King Edward VII.)	Aver. of six tubers	4 lb. 6 oz.	3 lb. 14 oz.
Dark type (Red King)	,, ,,	3 lb. 12 oz.	3 lb. 8 oz.

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90. Leader (Veitch).—Plant dark green; haulm vigorous, erect, tinged; foliage large, flat; flowers many, dropping without opening; tubers red, flat kidney, medium to large, smooth; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 54 lb. (Scotch seed).

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91, 92. Cardinal (Veitch, Carter).—Plant dark green; haulm straggling, purple; foliage small, wrinkled; flowers many, mauve, white-tipped, dropping; tubers medium, smooth; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 44 lb. (Scotch seed), 44 lb. (Scotch seed). Raised by Mr. McAlister. Introduced by Messrs. R. Veitch.

d. Tubers Round or Flat-round, White or Yellow.

13, 14. Great Scot (Barr, Veitch).—Plant dark green; haulm of medium height, more or less erect, tinged; foliage medium,

wrinkled; flowers white, many, dropping; tubers round, medium to large, mostly smooth; eyes rather deep; eyebrows somewhat prominent; flesh pale yellow. Crop, 68 lb. (Bucks seed); 88 lb. (Devon seed). Raised and introduced by Mr. McAlister.

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41. Abundance (Sutton).—Plant dark green; haulm vigorous, erect, tinged at nodes; foliage medium to large, flat; flowers few, white, persistent; tubers flat round, smooth, of medium size; eyes shallow, small; eyebrows inconspicuous; flesh white. Crop, 74 lb. (Perthshire seed). Raised by Mr. J. Clark. Introduced by Messrs. Sutton, 1886.

31. King Albert (Sands).—Plant dark green; haulm vigorous, erect, tinged; foliage medium, flat; flowers white, many, persistent; tubers flat round, large, smooth; eyes shallow, few; eyebrows more or less prominent; flesh pale yellowish white. Crop, 72 lb. (Irish seed). Raised and introduced by Mr. Sands. A cross between 'Abundance' and 'Leinster Wonder,' 1912.

16. Culdees Castle (Simpson).—Plant dull green; haulm vigorous, erect, green; foliage large, slightly wrinkled; flowers white, many, persistent; tubers round, large; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 82 lb. (Dumfries seed).

12. Patagonian (Dobbie).—Plant dark green; haulm more or less vigorous and erect, but plants not uniform, tinged; foliage medium, wrinkled; flowers white, many, persistent; tubers round or flat round, smooth, of medium size; eyes shallow; eyebrows inconspicuous; flesh white. Crops, 39 lb. (Midlothian seed). Imported from Patagonia.

8. The Provost (Dobbie), **XX** Sept. 5, 1916.—Plant dark green; haulm vigorous, erect; foliage medium, somewhat wrinkled; flowers white, few, persistent; tubers flat round, slightly russeted, medium to large; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 95 lb. (East Lothian seed). Raised and introduced by Messrs. Dobbie.

7. The Diamond (Barr).—Plant dull green; haulm vigorous, erect, tinged above nodes; foliage medium, somewhat wrinkled; flowers white, many, persistent; tubers flat round, smooth, of medium size; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 61 lb. (Dumfries seed). Introduced by Messrs. Johnson.

44. The Crofter (Veitch).—Plant dull green; haulm vigorous, erect, green; foliage medium, flat; flowers white; tubers round or flat round, smooth, of medium size; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 76 lb. (Dumfries seed).

46. The Admiral (Dobbie).—Plant dark green; haulm vigorous, more or less erect, tinged in leaf axil; foliage medium, wrinkled; flowers white, many, persistent; tubers flat round, smooth, of medium size; eyes shallow, few; eyebrows inconspicuous; flesh white. Crop, 75 lb. (W. Lothian seed). Raised by Mr. T. Chapman. Introduced by Messrs. Dobbie

9, 15. Burnhouse Beauty (Dobbie, Simpson).—Plant yellowish green; haulm of medium height, erect, green or very slightly tinged; foliage medium, wrinkled; flowers mauve, few, dropping; tubers pebble-shaped, of medium size, smooth; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 63 lb. (W. Lothian seed); 64 lb. (Dumfries seed). Raised by Mr. J. Wolfe. Introduced by Messrs. Dobbie.

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18, 19, 20, 20A, 21, 22, 23.—Arran Chief (Dobbie, Veitch, Barr, A. Dickson, Simpson, Sydenham, Carter), No. 18, **XX** Sept. 5, 1916.—Plant dark green; haulm vigorous, erect, tinged; foliage medium to large, more or less wrinkled; flowers white, many dropping; tubers flat round, generally smooth, medium to large; eyes mostly shallow; eyebrows inconspicuous; flesh white or faintly tinged. Crop, 79 lb. (S), 71 lb. (S), 61 lb. (E), 76 lb. (I), 78 lb. (S), 48 lb. (E), 76 lb, (S) respectively. (S = Scotch, E = English I = Irish seed.) Raised by Mr. McKelvie.

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40. Sir Edward Carson (Sands).—Plant dark green; haulm vigorous, erect, green; foliage large, flat; flowers white, many, persistent; tubers pebble-shaped, of medium size, smooth; eyes shallow; eyebrows prominent; flesh white. Crop, 71 lb. (Irish seed).

48. Royalty (Carter).—Plant dark green; haulm of medium height, erect, tinged; foliage medium, flattish, glossy; flowers white, many, persistent; tubers round or flat-round, medium to large, skin somewhat netted; eyes rather deep; eyebrows fairly prominent; flesh white. Crop, 76 lb. (W. Scotland seed). Introduced by Messrs. Carter.

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27, 96. Scottish Farmer (Kent & Brydon).—Plant dull green; haulm of medium height, erect, tinged; foliage large, wrinkled; flowers many, mauve, tipped white, persistent; tubers round, of medium size, smooth; eyes rather deep; eyebrows rather prominent; flesh white. Crop, 53 lb., 59 lb. (Forfarshire seed). Introduced by Kent & Brydon.

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35. Industry (Webb).—Plant dark green; haulm more or less vigorous, spreading, tinged; foliage medium, flat; flowers few, dropping without opening; tubers round and pebble, medium, smooth; eyes rather deep; eyebrows rather prominent; flesh yellowish white. Crop, 58 lb. (Dumfries seed). Introduced by Messrs. Webb.

17. Satisfaction (Sutton).—Plant dark green; haulm of medium height, erect, tinged; foliage medium, wrinkled; flowers many, pale lilac, tipped white, persistent; tubers pebble, medium to large, smooth; eyes shallow; eyebrows inconspicuous; flesh white. Crop, 71 lb. (Ayrshire seed). Raised by Mr. Clark. Introduced by Messrs. Sutton.

24. Snowball (Carter).—Plant dull green; haulm of medium size, tinged, erect; foliage medium, wrinkled; flowers few, dropping in bud; tubers round, medium, smooth; eyes shallow; eyebrows rather prominent; flesh white. Crop, 64 lb. (North Scotland seed). Introduced by Messrs. Carter.

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50. Devanha Seedling (Smith).—Plant dark green; haulm vigorous, erect, tinged; foliage large, flat; flowers few, dropping in bud; tubers round and pebble, medium, smooth; eyes rather deep; eyebrows fairly prominent; flesh yellowish white. Crop, 78 lb. (Scotch seed).

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10. The Chapman (Dobbie), **XX** Sept. 5, 1916.—Plant dark green; haulm vigorous, tinged, erect; foliage large, more or less wrinkled; flowers mauve, tipped white, more or less persistent; tubers pebble and round, medium to large, smooth; eyes shallow; eyebrows inconspicuous; flesh yellowish white. Crop, 98 lb. (West Lothian seed). Raised by Mr. T. Chapman. Introduced by Messrs. Dobbie.

26. Dalhousie (Kent & Brydon).—Plant dull green; haulm of medium height, spreading; other characters as in 'The Chapman.' Crop, 64 lb.

49. Dumfries Model (Kerr).—Plant yellowish green; haulm of medium height, more or less spreading; eyes and eyebrows rather more pronounced. Other characters as in 'The Chapman.' Crop, 85 lb.

80, 81. Up-to-Date (Simpson, Barr).—Foliage flattish; tubers kidney or pebble; eyebrows rather prominent. Other characters as in 'The Chapman.' Crop, 96 lb. (Dumfries seed); 83 lb. (Dumfries seed). Raised by Mr. Findlay.

82, 83. The Factor (Barr, Dobbie), **XX** Sept. 5, 1916.—Characters as in 'Up-to-Date.' Crop, 58 lb. (Lincolnshire seed); 89 lb. (East Lothian seed). Raised by Mr. Chapman. Introduced by Messrs. Dobbie.

93. Donside Defiance (Cook), **XXX** Sept. 5, 1916.—Characters as in 'Up-to-Date.' Crop, 102 lb. (Aberdeen seed). Raised by Mr. David Cook from seed of 'Reading Russet,' 1912.

52. Longkeeper (Carter).—Characters as in 'Up-to-Date.' Crop, 109 lb.

53. Tremendous (Toogood).—Characters as in 'Up-to-Date.' Crop, 61 lb.

54. Cropper (Jones), **XX** Sept. 5, 1916.—Characters as in 'Up-to-Date.' Crop, 105 lb. (Irish seed). Introduced by Mr. Anketell-Jones.

56. British Hero (Carter).—Plant dull green; haulm faintly tinged; flowers dropping; eyebrows inconspicuous; other characters as in 'Up-to-Date.' Crop, 65 lb.

25. British Champion (Carter).—Plant grey green; haulm of medium height, tinged, rather spreading; foliage medium, wrinkled;

flowers as in 'Up-to-Date'; tubers pebble and kidney; medium to large, smooth; eyes shallow; eyebrows rather prominent; flesh white. Crop, 47 lb.

34. Stourbridge Glory (Webb).—Haulm green, erect; foliage large, flattish; other characters as in 'British Champion.' Crop, 54 lb. (Kidderminster seed). Introduced by Messrs. Webb.

42. Superlative (Sutton), **XX** Sept. 5, 1916.—Haulm erect; foliage medium, flattish; eyebrows inconspicuous; other characters as in 'British Champion.' Crop, 65 lb. (Perthshire seed). Raised by Mr. W. Coleman. Introduced by Messrs. Sutton.

30. Prolific (Dobbie), **XX** Sept. 5, 1916.—Plant dark green; haulm of medium height, tinged, erect; foliage medium, more or less wrinkled; flowers as in 'Up-to-Date'; tubers as in 'Superlative.' Crop, 69 lb. (East Lothian seed). Introduced by Messrs. Dobbie.

32. Liberty (A. Dickson).—Foliage flattish; other characters as in 'Prolific.' Crop, 77 lb. (Co. Down seed). Raised and introduced by Messrs. A. Dickson.

38. Balgownie Seedling (Yule).—Plant dull green; haulm vigorous, erect; eyes rather deep; flesh lemon; other characters as in 'British Champion.' Crop, 71 lb. (Scotch seed).

58. Drumwhindle (Gavin).—Foliage flattish; eyes shallow; flesh white; other characters as in 'Balgownie Seedling.' Crop, 112 lb. (Scotch seed).

61. Duchess of Cornwall (Williamson).—Plant rather light green; flesh yellowish white; other characters as in 'British Champion.' Crop, 80 lb. (Irish seed).

95. Dargavel (Kerr).—Plant dark shining green; foliage large, flattish, somewhat glossy; haulm, flower and tuber characters as in 'Up-to-Date.' Crop, 98 lb. (Dumfries seed).

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28. Gordon Castle (Sutton).—Plant dark green; haulm of medium height, spreading, green; foliage medium, wrinkled, glossy; flowers few, dropping in bud; tubers pebble, of medium size, smooth; eyes shallow; eyebrows rather prominent; flesh white. Crop, 60 lb. (Perthshire seed). Raised by Rev. Aikman Paton. Introduced by Messrs. Sutton.

63. Goldfinder (Carter).—Characters as in 'Gordon Castle,' but stem tinged at node; foliage flatter and less glossy; tubers pebble and kidney. Crop, 65 lb. (N. Scotch seed). Introduced by Messrs. Carter.

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39. Irish Hero (Sands).—Plant dull green; haulm of medium height, erect, green; foliage medium, wrinkled; flowers many, white, dropping; tubers pebble and round, medium, rough-skinned; eyes and eyebrows rather prominent; flesh white. Crop, 75 lb. (Irish seed). Raised and introduced by Mr. Sands. 'Sharpe's Express' × 'Abundance.'

11. Isis (Dobbie).—Plant dull green; haulm vigorous, erect, tinged; foliage medium, wrinkled; flowers white, small, many, persistent; tubers round, some irregular, rough, netted; eyes rather deep; eyebrows fairly conspicuous; flesh yellowish white. Crop 63 lb. (Midlothian seed). Raised by Mr. Brown.

e. Tubers Round, Coloured.

2. Kerr's Pink (Dobbie).—Plant dull green; haulm vigorous, erect, tinged; foliage large, flat; flowers many, white, dropping; tubers round, pink, medium, rough-skinned; eyes variable; eyebrows inconspicuous; flesh yellowish white. Crop, 86 lb. (Scotch seed).

3. King of the Russets (Carter).—Plant dark green; haulm of medium size, erect, tinged; foliage medium, more or less wrinkled; flowers many, white, persistent; tubers round, pink, of medium size, rough; eyes of medium depth; eyebrows rather prominent; flesh yellowish white. Crop, 49 lb. (Herefordshire seed). Introduced by Messrs. Carter.

33. Leinster Wonder (Martineau).—Plant dull green; haulm small, erect, tinged; foliage medium, wrinkled; flowers and tubers as in 'King of the Russets.' Crop, 47 lb. (Berkshire seed).

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4, 5. The Lochar (Dobbie, Veitch).—Plant dull green; haulm vigorous, erect, green; foliage medium, wrinkled; flowers white, many, dropping; tubers round, slightly flushed pink round eye, medium to large, smooth; eyes shallow; eyebrows inconspicuous; flesh yellowish; Crop, 105 lb. (Scotch seed), 76 lb. (Dumfries seed). Raised by Mr. Farish.

37. Prosperity (Webb).—Haulm tinged; eyes rather deeper, and eyebrows somewhat prominent. Otherwise like 'The Lochar.' Crop, 92 lb. (Dumfries seed). Introduced by Messrs. Webb.

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1. Mauve Queen (Dobbie).—Plant dull green; haulm of medium height, erect, tinged; foliage medium, wrinkled and curled; flowers few, white, persistent; tubers flat-round and pebble, mauve, smooth, of medium size; eyes and eyebrows variable; flesh purple. Crop, 27 lb. (Scotch seed). Raised by Mr. R. Scarlett. Introduced by Messrs. Dobbie.

SHALLOTS AT WISLEY, 1917.

FIVE stocks of bulbs and one of Shallot seeds were sent in for trial in 1917. Judging from the samples received, large bulbs appear to be in demand instead of the smaller, true Shallot. The larger—forms probably of the Jersey Shallot—do not appear to keep quite so well as the smaller ones, which are, after the outer coats are removed, so useful for pickling, and keep with little trouble in a cool dry place until May, and are thus useful for seasoning practically the year round. Shallots succeed where onions fail owing to the onion maggot. This pest rarely attacks Shallots, and Shallots are of very easy cultivation. Planting should be done in January, the bulbs being merely pushed into the ground, not covered with soil; they should be harvested in July as soon as the leaves die off, thoroughly dried, and stored in shallow boxes.

1, 5.* Exhibition Purple (R. Veitch).—Bulb very large, oval, heavy; of a purplish-red colour; producing an average of 7 to a plant. Stock good. The same variety under No. 5 was grown from seed and came true, but gave a very poor plant.

2. Giant Red Exhibition (Simpson).—Bulbs variable, of small to medium size, flattened oval, light; of a reddish-brown colour. Stock uneven.

3. Large Red Exhibition (Dobbie).—Bulb very large, oval, heavy; of shining purplish-red colour; producing an average of 7 to a plant. Stock good.

6. Selected Large Red (Stokes).—Bulbs of medium to large size, oval, fairly heavy; of a reddish-brown colour; producing 6 to 8 to a plant. Stock fairly good.

4. Yellow-skinned (Simpson).—Bulb of medium size, flattened oval, heavy; of a brownish-yellow colour; producing good clusters. Stock good.

* See footnote, p. 107.

AUTUMN-SOWN ONIONS AT WISLEY, 1916–17.

EIGHTY-SEVEN packets of Onion seed were sent in for sowing in autumn 1916. The seed was sown on August 23 on ground occupied earlier in the year by the mid-season pea trial. It was dug over and received a moderate dressing of farmyard manure before the seed was sown. The drills were made 15 inches asunder, and, with the exception of two stocks, the germination was excellent. The seedlings remained in this bed until early March 1917, when they were transplanted into land similarly treated, except that it had been dug in September and remained rough all winter. Two rows of each variety were planted 8 inches apart, fifty plants in a row, and the rows 15 inches apart; the remainder were allowed to stand in the seed-bed after thinning out. Little growth was made by the transplanted plants until late April, after which they grew away well. Most stocks bolted into flower, however, whether transplanted or not, the least prone to it being Nos. 1, 3, 5, 12–17, 39, 40, 58, 59, 61, 69, 70, 80–83, mainly Tripoli onions, but including 'Autumn Triumph,' 'Record,' and 'Froxfield.' This had little effect on the crop, however, for the tops of the flowering shoots were promptly pinched out and most of the plants made splendid bulbs.

While the spring-sown Onions on an adjacent plot suffered badly from an attack of Onion fly, this pest was not seen on this plot, a point greatly in favour of the autumn-sowing of Onions; nor did Onion mildew give any trouble.

A feature of the trial was the number of seeds from American sources which were included. On the whole, the plants derived from these tended to ripen off somewhat sooner than those of the same type from English seed, but there was no great difference in the crops, and the bulbs from American seed kept as well as those from English. Many of the varieties included in the trial are of course not fit for storing, but are grown to be used either while still young and green, like the 'White Lisbon,' or immediately they are large enough. They are in fact best regarded as varieties suitable for bridging the gap between the stored Onions of the previous year and the new crop. None of the white-skinned Onions kept for any length of time after harvesting, and though the Tripoli type of Onion gives a heavy crop, it is better to choose some other type for storing for winter and early spring use.

The Fruit and Vegetable Committee examined the trial on July 27, and selected the following for the award indicated:

Award of Merit.

40. Autumn Triumph, from Mr. Beckett.
70. Froxfield, from Messrs. Barr.

83. Mammoth Red Tripoli, from Messrs. Webb.

11. White Leviathan, from Messrs. Sutton.

23. Yellow Rocca, from Messrs. Harrison.

Highly Commended.

48. Ailsa Craig, from Messrs. Wilson.

5. Covent Garden, from Messrs. Barr.

30, 31. Cranston's Excelsior, from Messrs. Barr and Messrs. Wilson (**A.M.** 1907 (Barr, Carter, Nutting, Veitch)).

59. Giant Globe Rocca, from Messrs. Barr.

20, 21, 22. Giant Lemon Rocca, from Messrs. Sutton, Nutting, and Webb.

56. Giant Rocca Tripoli, from Messrs. Sydenham.

79. Red Italian Tripoli, from Messrs. Nutting.

32, 33. Trebons, from Messrs. Barr and Messrs. Nutting (**F.C.C.** 1876 (Barr, Stuart & Mein, Vilmorin)).

15. White Italian Tripoli, from Messrs. Veitch.

8. White Spanish, selected, from Messrs. Barr.

Commended.

47, 49, 53. Ailsa Craig, from Messrs. Harrison, R. Veitch, and Sutton.

82. Bassano Tripoli, from Messrs. Veitch.

39. Giant Zittau, from Messrs. Harrison (**F.C.C.** 1880 (Benary)).

25. The Sutton Globe, from Messrs. Sutton.

12. White Emperor, from Messrs. Carter.

13. White Italian, from Messrs. Harrison.

Where an award had been made in earlier years to one of the varieties now selected by the Committee, it is indicated in parentheses with the date and sender. Where certain stocks only of those sent for trial of one variety are indicated, the Committee selected those stocks as the best of the variety; *e.g.* there were ten stocks named 'Ailsa Craig' (Nos. 45 to 54) sent for trial, one of which (No. 54) proved to be a splendid stock of an Onion of the white Spanish type; and one (No. 45) was slightly different in the form of the bulb from the rest; of the others the Committee selected Messrs. Wilson's stock (No. 48) as the best, recommending the award of Highly Commended, and Nos. 47, 49, and 53, from Messrs. Harrison, R. Veitch, and Sutton respectively, for commendation, passing over Nos. 46, 48, 50, 51, 52 as being somewhat less good in some particular. A similar thing occurred with several other varieties.

The following varieties which had received awards in earlier trials were represented but not considered on this occasion equal to those mentioned in the foregoing list: 'Crimson Globe' (87), 'Nuneham Park' (64), 'Rousham Park Hero' (71), 'Sutton's A1' (65), 'Southport Red Globe' (86), 'Southport Yellow Globe' (18).

The crop weight given below is that from the transplanted plants, and is usually the weight of 100 plants. The bulbs of those left where they were sown were scarcely less good, but the number of plants left in

these rows varied, and there was rather more irregularity in the size of the bulbs.

As suggested above, the keeping qualities of Onions are among the most important points to the cultivator. Some of those in the trial are of value only in the summer and early autumn, while others keep well on into the spring. An endeavour has been made to indicate the relative keeping qualities in the following table, where the figure 3 in the column indicates that the variety was still very good at the date given at the top of the column, 2 that it was still usable, 1 that many were past use, and — that none had kept until this date. It will be seen that some stocks of certain varieties proved to be better keepers than others with the same name.

VARIETIES AND KEEPING QUALITIES.

No.	Variety.	Oct. 15.	Nov. 15.	Dec. 1.	Dec. 15.	Jan. 1.	Jan. 15.	Feb. 15.
*1	Early White Marzaiola Tripoli	—	—	—	—	—	—	—
2	White Lisbon	—	—	—	—	—	—	—
3	Early White Barletta	—	—	—	—	—	—	—
4	Early Golden Gem	3	3	3	3	3	2	2
5	Covent Garden Silver-skinned Pickling	—	—	—	—	—	—	—
6	Silver Globe	—	—	—	—	—	—	—
7	Southport White Globe	—	—	—	—	—	—	—
8	White Spanish Selected	3	3	3	3	3	3	3
9	White Portugal	—	—	—	—	—	—	—
10	Large Silver Flat	—	—	—	—	—	—	—
11	White Leviathan	—	—	—	—	—	—	—
12	White Emperor	—	—	—	—	—	—	—
13	White Italian	—	—	—	—	—	—	—
14	Monster White Tripoli	—	—	—	—	—	—	—
15	White Italian Tripoli	—	—	—	—	—	—	—
16	Large White Italian Tripoli	—	—	—	—	—	—	—
17	Giant White Italian Tripoli	—	—	—	—	—	—	—
18	Southport Yellow Globe	3	3	3	3	3	3	3
19	Straw-coloured Rocca	1	—	—	—	—	—	—
20	Giant Lemon Rocca	—	—	—	—	—	—*	—
21	Lemon Rocca	—	—	—	—	—	—	—
22	Giant Rocca Lemon Coloured	—	—	—	—	—	—	—
23	Yellow Rocca	1	—	—	—	—	—	—
24	Up-to-Date Selected	3	3	3	3	3	3	3
25	The Sutton Globe	3	3	3	3	3	3	3
26	Ohio Yellow Globe	3	3	3	3	3	3	3
27	Masterpiece	2	1	1	—	—	—	—
28	Cranston's Excelsior	3	2	1	—	—	—	—
29	Cranston's Excelsior	3	3	3	3	3	3	2
30	Cranston's Excelsior	2	2	1	—	—	—	—
31	Cranston's Excelsior	2	2	1	—	—	—	—
32	Trebons	3	3	2	2	2	1	—
33	Trebons	3	3	3	3	3	3	2
34	Danvers' Yellow Globe	3	3	3	3	3	3	3
35	Danvers' Yellow Flat	3	3	3	3	3	3	[2
36	Reliance	3	3	3	3	3	3	3
37	Giant Yellow Zittau	3	3	3	3	3	3	3
38	Zittau Giant	3	2	2	1	1	1	—
39	Giant Zittau	3	3	3	3	3	3	3
40	Autumn Triumph	3	3	3	3	3	3	3
41	Perfection	3	3	3	3	2	2	2

* See footnote, p. 107.

No.	Variety.	Oct. 15.	Nov. 15.	Dec. 1.	Dec. 15.	Jan. 1.	Jan. 15.	Feb. 15.
42	Giant Gibraltar	—	—	—	—	—	—	—
43	Yellow Dutch or Strasburg	3	2	2	1	1	—	—
44	Prizetaker	3	2	2	1	1	1	—
45	Ailsa Craig "true type"	3	2	2	2	2	2	2
46	Ailsa Craig, reselected	3	2	2	2	2	2	1
47	Ailsa Craig, reselected	3	2	2	2	1	1	—
48	Ailsa Craig, reselected	3	3	2	1	1	—	—
49	Ailsa Craig, reselected	3	3	2	2	1	1	—
50	Ailsa Craig, reselected	2	1	1	—	—	—	—
51	Ailsa Craig, reselected	3	3	2	2	2	2	1
52	Ailsa Craig, reselected	3	3	3	3	2	2	2
53	Ailsa Craig (Sutton's Selected)	3	3	2	2	2	2	1
54	Wrongly named	3	2	2	2	2	1	—
55	Gloucester Mammoth	2	2	2	1	1	1	—
56	Giant Rocca Tripoli	1	1	—	—	—	—	—
57	Giant Rocca	2	1	1	—	—	—	—
58	Giant Rocca	3	2	1	1	—	—	—
59	Giant Globe Rocca	2	1	1	—	—	—	—
60	Giant Rocca	2	1	1	—	—	—	—
61	Giant Rocca	2	2	2	1	—	—	—
62	Bedfordshire Champion (Sutton's Strain)	3	3	3	3	3	3	3
63	Bedfordshire Champion, Selected	3	3	3	3	3	3	3
64	Nuneham Park	3	3	3	3	3	3	3
65	Sutton's A1	3	3	3	3	3	3	3
66	Magnum Bonum Improved	3	3	3	2	2	2	2
67	White Spanish (Sutton's Strain)	3	3	3	3	3	3	2
68	Improved Reading]	3	3	3	3	3	3	2
69	Record	2	1	—	—	—	—	—
70	Froxfield	3	3	3	3	3	3	3
71	Rousham Park Hero	3	3	3	3	3	3	3
72	Brown Globe	3	3	3	3	3	3	3
73	Australian Brown	3	3	3	3	3	3	3
74	Barr's Long-Keeper	3	3	3	3	3	3	2
75	Sutton's Long-Keeping	3	3	3	3	3	3	3
76	James' Long-Keeping	3	3	3	3	3	3	3
77	Extra Early Red Flat	3	3	2	2	2	1	1
78	Red Wethersfield	3	3	3	2	2	1	—
79	Red Italian Tripoli	2	1	—	—	—	—	—
80	Large Red Italian	2	1	—	—	—	—	—
81	Red Italian	—	—	—	—	—	—	—
82	Bassano Tripoli	2	1	—	—	—	—	—
83	Mammoth Red Tripoli	2	1	1	1	—	—	—
84	Giant Red Garganus	2	1	1	—	—	—	—
85	Flat Red Genoa	2	1	1	—	—	—	—
86	Southport Red Globe	3	3	3	3	3	2	1
87	Crimson Globe	3	3	3	3	2	2	2

I. White Varieties.

(*a*) *Bulbs flat-round.*

3. Early White Barletta (Nutting).—Bulb medium to large; fairly solid; outer skin white, inner greenish. Crop, 22 lb.; rather uneven.

1. Early White Marzaiola Tripoli (Nutting).—Bulb medium to large; fairly solid; outer skin white, inner greenish. Crop, 15 lb.; fairly even. Kept better than many white forms.

17. Giant White Italian Tripoli (Sydenham).—Bulb large; solid; outer skin white, inner greenish. Crop, 30½ lb.; fairly even. Two brown rogues.

10. Large Silver Flat (Barr).—Bulb medium; fairly solid; outer skin yellowish white, inner greenish. Crop, 26 lb.; fairly even.

16. Large White Italian Tripoli (Nutting).—Bulb medium to large; fairly solid; outer skin yellowish white, inner greenish. Crop, 17½ lb.; rather uneven.

14. Monster White Tripoli (Webb).—Bulb large; solid; outer skin yellowish white, inner greenish. Crop, 31½ lb.; even.

12. White Emperor (Carter), **XX** July 27, 1917.—Bulb fairly large; solid; outer skin yellowish white, inner greenish. Crop, 33 lb.; even. Two brown rogues.

13. White Italian (Harrison), **XX** July 27, 1917.—Bulb large; solid; outer skin yellowish white, inner greenish. Crop, 30 lb.; even.

15. White Italian Tripoli (R. Veitch), **XXX** July 27, 1917.—Bulb large; solid; outer skin yellowish white, inner greenish. Crop, 31 lb.; even. Stock true.

11. White Leviathan (Sutton), **A.M.** July 27, 1917. Bulb large; solid; outer skin yellowish white, inner greenish. Crop, 43½ lb., even, true.

9. White Portugal (Morse).—Bulb small to medium; not very solid; outer skin yellowish white, inner greenish. Crop, 19½ lb.; rather uneven.

(*b*) *Bulbs oval.*

5. Covent Garden (Silver-skinned Pickling) (Barr), **XXX** July 27, 1917.—Bulb medium to large; flattish oval; solid; outer skin white, inner greenish. Crop, 24½ lb.; fairly even.

6. Silver Globe (Barr).—Bulb medium; flattish oval; fairly solid; outer skin white, inner greenish. Crop, 24 lb.; rather uneven.

7. Southport White Globe (Morse).—Bulb small to medium; rather soft; outer skin white, inner greenish. Crop, 13 lb.; uneven; some flat.

2. White Lisbon (Harrison).—Bulb large; flattish oval; solid; outer skin white, inner greenish. Crop, 35½ lb.; mixed. Nine brownish rogues.

II. Yellow Varieties.

(*a*) *Bulbs flat.*

37, 38, 39. Giant Yellow Zittau (R. Veitch, Barr, Harrison), No. 39, **XX** July 27, 1917.—Bulb medium to large; fairly solid; outer skin dark straw colour, inner greenish yellow. Crop, 28½ lb., 39 lb., 46½ lb., even. No. 37 was thicker-necked and contained some reddish rogues and No. 38 contained some oval bulbs.

68. Improved Reading (Sutton).—Bulb medium; fairly solid;

outer skin dark straw-yellow, inner greenish yellow. Crop, 39½ lb.; fairly even.

64. Nuneham Park (Barr).—Bulb medium; fairly solid; outer skin dark straw-yellow, inner yellow. Crop, 26½ lb.; even.

36. Reliance (Webb).—Bulb medium; fairly solid; outer skin dark straw colour, inner greenish yellow. Crop, 28½ lb.; mixed, mostly flat-round.

67. White Spanish (Sutton).—Bulb medium; fairly solid; outer skin dark straw-yellow, inner yellow. Crop, 28 lb.; fairly even.

8. White Spanish Selected (Barr), **XXX** July 27, 1917.—Bulb large; solid; outer skin brownish yellow, inner yellow-green. Crop, 47½ lb.; even. Good stock.

35. Yellow Danvers' Flat (Morse).—Bulb medium; fairly solid; outer skin dark straw colour, inner greenish yellow. Crop, 27½ lb.; fairly even; a few brownish-red rogues. Not unlike 8 but smoother.

43. Yellow Dutch or Strasburg (Morse).—Bulb small to medium; rather soft; outer skin straw-yellow, inner yellow. Crop, 19 lb.; uneven.

(*b*) *Bulbs oval.*

65. A1 (Sutton).—Bulb medium to large; solid; outer skin dark straw-yellow, inner yellow. Crop, 35 lb.; even, some flattish, rather long-necked.

45, 46, 47, 48, 49, 50, 51, 52, 53. Ailsa Craig (Watkins & Simpson, Carter, Harrison, Wilson, R. Veitch, Nutting, Barr, Morse, Sutton), No. 48, **XXX** Nos. 47, 49, and 53, **XX** July 27, 1917.—Bulb medium to large; solid; outer skin straw-yellow to dark straw-yellow, inner greenish yellow and yellow. Crop, 45½ lb., 44 lb., 51 lb., 54 lb., 52 lb., 45 lb., 45 lb., 47½ lb., 41½ lb.; fairly even to even. Nos. 45, 50, and 51 contained some bulbs of a flatter type, and Nos. 46 and 52 were not quite true to colour and shape. No. 45, which was sent as the "true type," was somewhat flattened on one side near the base in many cases, while the remainder were uniformly round. No. 53 was a taller form than the others.

40. Autumn Triumph (Beckett), **A.M.** July 27, 1917.—Bulb large; very solid; outer skin dark straw colour, inner greenish yellow. Crop, 60½ lb.; even. Very good stock. Raised by Mr. A. Hubbard, introduced by Mr. Edwin Beckett.

62, 63. Bedfordshire Champion (Sutton, Barr).—Bulb medium; fairly solid; outer skin straw-yellow, inner greenish yellow. No. 62 a good stock. Crop, 39 lb.; even. No. 63 uneven, mixed, and darker in colour. Crop, 33½ lb.

28, 29, 30, 31. Cranston's Excelsior (Nutting, Watkins & Simpson, Barr, Wilson), Nos. 30 and 31, **XXX** July 27, 1917.—Bulb medium to large; solid; outer skin dark straw-yellow, inner greenish yellow. Crop, 46 lb., 40½ lb., 54½ lb., 48½ lb. Nos. 28 and 29 were flatter bulbs, and No. 30 deeper in colour. The Committee considered there

was practically no difference between this and most forms of 'Ailsa Craig,' *q.v.*

34. Danvers' Yellow Globe (Morse).—Bulb medium; fairly solid; outer skin dark straw colour, inner greenish yellow. Crop, 25½ lb.; uneven. Mixed, poor, several red.

4. Early Golden Gem (Barr).—Bulb small to medium; flattish oval; rather soft; outer skin white and golden brown, inner greenish striped. Crop, mixed in size and colour. Germination poor.

42. Giant Gibraltar (Carter).—Bulb medium to large; fairly solid; flattish oval; outer skin straw-yellow, inner yellow. Crop, 44 lb.; fairly even. Mixed, good many reds.

20, 21, 22, 23. Giant Lemon Rocca (Sutton, Nutting, Webb, Harrison), No. 23, **A.M.** Nos. 20, 21, and 22, **XXX** July 27, 1917.—Bulb large; solid; flattish oval; outer skin straw-yellow, some reddish brown, inner greenish yellow. Crop, 65 lb., 60½ lb., 61 lb., 56½ lb.; even.

56, 57, 58, 59, 60, 61. Giant Rocca Tripoli (Sydenham, Webb, Nutting, Barr, Harrison, R. Veitch), Nos. 56 and 59, **XXX** July 27, 1917.—Bulb large; solid; some flattish oval; outer skin brown and reddish, inner white, greenish yellow and reddish. Crop, 63 lb., 69½ lb., 59 lb., 69½ lb., 53½ lb., 59½ lb.; rather uneven. Nos. 57, 58, 60, and 61, mixed, some white.

55. Gloucester Mammoth (Wheeler).—Bulb small to medium; rather soft; outer skin dark straw to brown, inner greenish yellow. Crop, 56 lb.; fairly even. Raised and introduced by Messrs. J. C. Wheeler, of Gloucester, 1914.

66. Magnum Bonum Improved (Barr).—Bulb medium; fairly solid; outer skin dark straw-yellow, inner greenish yellow. Crop, 34 lb.; even. Mixed.

27. Masterpiece (Webb).—Similar to Cranston's Excelsior. Crop, 44½ lb.

26. Ohio Yellow Globe (Morse).—Bulb medium to large; fairly solid; outer skin dark straw-yellow, inner greenish. Crop, 33 lb. Not very good stock, rather thick-necked.

41. Perfection (Sutton).—Bulb medium; fairly solid; outer skin straw-yellow or yellow, inner greenish yellow. Crop, 62½ lb.; even, rather thick-necked.

44. Prizetaker (Morse).—Bulb medium; solid; flattish oval; outer skin dark straw-yellow, inner yellow. Crop, 42 lb.; even.

69. Record (Carter).—Bulb medium to large; solid; outer skin brownish, tinged red; inner white, yellow and reddish. Crop, 47½ lb.; mixed, some white.

18. Southport Yellow Globe (Morse).—Bulb medium; variable, some solid, some loose; outer skin yellow-brown, inner greenish, some reddish. Crop, 22½ lb.; uneven, some fairly heavy.

19. Straw-coloured Rocca (R. Veitch).—Bulb large; solid; outer skin straw-yellow, some reddish, inner greenish yellow. Crop, 55½ lb.; uneven. Rather mixed, some reddish, rather thick-necked.

25. The Sutton Globe (Sutton), **XX** July 27, 1917.—Bulb medium; fairly solid; outer skin dark straw-yellow, inner greenish. Crop, 43½ lb.; even.

32, 33. Trebons (Barr, Nutting), **XXX** July 27, 1917.—Bulb large; solid; outer skin dark straw colour, inner greenish yellow. Crop, 61½ lb., 60½ lb.; even. No. 33 a very good stock.

24. Up-to-Date Selected (Barr).—Bulb medium; fairly solid; outer skin dark straw, inner yellow. Crop, 32 lb.; uneven. Not true, some red flat.

III. Brown Varieties.

(*a*) *Bulbs flat.*

71. Rousham Park Hero (Barr).—Bulb medium; fairly solid; outer skin brown, inner yellow. Crop, 24½ lb.; uneven.

(*b*) *Bulbs oval.*

73. Australian Brown (Morse).—Bulb small to medium; rather loose; outer skin brown and red, inner greenish yellow and red. Crop, 23 lb.; rather uneven.

72. Brown Globe (Morse).—Bulb small to medium; rather loose; outer skin brown, inner greenish yellow. Crop, 24½ lb.; fairly even. Some reddish.

70. Froxfield (Barr), **A.M.** July 27, 1917.—Bulb medium; fairly solid; outer skin brown, inner yellow. Crop, 45½ lb.; even. A very true and even stock, but rather variable in shape.

76. James' Long-Keeping (Barr).—Bulb medium; fairly solid; outer skin reddish brown, inner yellow-green tinged golden. Crop, 29½ lb.; fairly even.

74. Long-Keeper (Barr).—Bulb small to medium; rather loose; outer skin brown, inner yellow. Crop 18 lb., rather uneven, some reddish.

(*c*) *Bulbs coconut-shaped.*

75. Long-Keeping (Sutton).—Bulb medium; fairly solid; outer skin reddish brown, inner greenish yellow. Crop, 33½ lb.; even.

IV. Red Varieties.

(*a*) *Bulbs flat.*

82, 83. Bassano Tripoli (R. Veitch, Webb).—No. 82 **XX**, No. 83, **A.M.** July 27, 1917.—Bulb large; solid; outer skin red-purple, inner red-purple; flesh white, tinged at margins. Crop, 52 lb., 55 lb.; fairly even.

77. Extra Early Red Flat (Morse).—Bulb medium; solidity variable; outer skin dark purple-red, inner reddish; flesh white, tinged at margins. Crop, 20½ lb.; uneven.

84, 85. Flat Red Genoa (Nutting, Barr).—Bulb large; solid; outer skin deep red-purple, inner red-purple; flesh white, tinged at margins. Crop, 30 lb.; 47 lb., fairly even. No. 84 had several white and No. 85 some brownish.

79, 80, 81. Red Italian Tripoli (Nutting, Carter, Harrison), **A.M.** October 10, 1893; No. 79, **XXX** July 27, 1917.—Bulb large; solid; outer skin red-purple, inner reddish purple, white base; flesh white, tinged at margins. Crop, 61½ lb., 31 lb.; even. Nos. 80 and 81 mixed red and white, and not keeping.

(*b*) *Bulbs oval.*

86, 87. Southport Red Globe (Morse, Barr), **F.C.C.** November 13, 1888.—Bulb small; rather loose; outer skin deep red-purple, inner red-purple; flesh white. Crop, 16 lb., 17 lb.; uneven, poor.

78. Red Wethersfield (Morse).—Bulb medium, variable; some solid, some loose; outer skin dark purple-red, inner reddish purple; flesh white, tinged at margins. Crop, 17½ lb.; uneven. Some flat.

SPRING-SOWN ONIONS AT WISLEY, 1917.

FORTY-THREE stocks of Onions were sent in for trial in the spring of 1917. The seeds were sown on land which had been occupied by peas in 1916. After the peas were cleared away in August, mustard was sown, and the crop dug in in October, the ground remaining rough through the winter. The seeds were sown on March 20 in rows 14 inches apart, and, with the few exceptions which are noted below, germinated well, and growth was good until about the middle of May, by which time they had been dusted with soot three times. The Onion fly, which is always a serious pest at Wisley on spring-sown Onions, then made its appearance, and its attacks were only partially prevented by the use of paraffined sand sprinkled along the rows. The crop was consequently very irregular, and the weights produced are therefore not included in the notes given below. On thinning, 6 inches was allowed from plant to plant. The Fruit and Vegetable Committee visited the trial on September 28 and recommended the following awards:

Highly Commended (**XXX**).

35. A1, sent by Messrs. Sutton (**F.C.C.** 1893 (Sutton)).
20. Ailsa Craig, sent by Messrs. Dobbie.
12. Bedfordshire Champion, sent by Messrs. Sutton.
32. Champion, sent by Messrs. E. W. King.

Commended (**XX**).

25, 26. Up-to-Date, sent by Messrs. Nutting and Mr. Gray.

In addition to the earlier award mentioned above, stocks of the following had received awards in previous trials: 'White Leviathan' (**A.M.** 1917); 'Cranston's Excelsior' (**A.M.** 1907); 'White Globe' (**F.C.C.** 1883).

VARIETIES.

1.* Silver-skinned Pickling.
2. Improved Queen.
3. White Leviathan.
4. Nuneham Park.
5., 6., 7. Cranston's Excelsior.
8. Main Crop, Veitch's.
9. Main Crop, Dobbie's.
10. White Spanish.
11. Improved White Globe.
12., 13., 14. Bedfordshire Champion.
15. The Sutton Globe.
16. Perfection.
17. Improved Reading.
18., 19., 20. Ailsa Craig.
21. Ailsa Craig, Selected.
22. Giant Lemon Rocca.
23. Golden Globe.
24. Sandy Giant.
25., 26. Up-to-Date.
27. Prize Brown Globe.
28. Trebons.
29. Danvers' Yellow.
30. James' Keeping.

* See footnote, p. 107.

31. Sandy Prize.
32. Champion.
33. } Giant Zittau.
34. }
35. A1.
36. Early Gem.
37. Sandy Gem.
38. Giant Rocca.
39. Blood Red Large Globe.
40. Selected Red.
41. Walker's Exhibition.
42. Long Keeping.
43. Brown Globe.

Descriptions.

I White Varieties.

Bulbs flat.

2. Improved Queen (Sutton).— Failed.

1. Silver-skinned Pickling (R. Veitch).—Bulb small; rather soft; outer skin white, inner greenish; rather uneven.

3. White Leviathan (Sutton).—Crop even. See No. 11, Autumn-sown Onions.

II. Yellow Varieties.

(*a*) *Bulbs flat.*

32. Champion (E. W. King), **XXX** September 28, 1917.—Bulb large; solid; outer skin brown straw, inner yellow green. Even.

33, 34. Giant Zittau (R. Veitch, Nutting).—Crop fairly even. See Nos. 37–39, Autumn-sown Onions.

17. Improved Reading (Sutton).—Crop even. See No. 68, Autumn-sown Onions.

4. Nuneham Park (R. Veitch).—Crop even; bulb flat-round. See No. 64, Autumn-sown Onions.

31. Sandy Prize (Gray).—Bulb of medium size; fairly solid; rather uneven; outer skin brown straw, inner greenish yellow.

41. Walker's Exhibition (Nutting).—Bulb large; solid; outer skin straw-yellow, inner greenish yellow; fairly even.

10. White Spanish (R. Veitch).—Crop poor. See No. 8, Autumn-sown Onions.

(*b*) *Bulbs oval.*

35. A1 (Sutton), **XXX** September 28, 1917.—Crop even. See No. 65, Autumn-sown Onions.

18, 19, 20, 21. Ailsa Craig (R. Veitch, Simpson, Dobbie, Sutton), No. 20, **XXX** September 28, 1917.—Stocks Nos. 18 and 19 were uneven. See 45, 46 &c., Autumn-sown Onions.

12, 13, 14. Bedfordshire Champion (Sutton, Simpson, R. Veitch), No. 12, **XXX** September 28, 1917.—Nos. 13 and 14 were not as good stocks and darker in colour. See Nos. 62 and 63, Autumn-sown Onions.

5, 6, 7. Cranston's Excelsior (R. Veitch, Dobbie, Nutting).—Crop fairly even. See Nos. 28–31 Autumn-sown Onions.

29. Danvers' Yellow (R. Veitch).—Crop fairly even. Some flat-round. See No. 34, Autumn-sown Onions.

22. Giant Lemon Rocca (Sutton).—Crop rather uneven. See Nos. 20 and 21, Autumn-sown Onions.

23. Golden Globe (Dobbie).—Bulb of medium size; fairly solid; outer skin brown straw, inner greenish. Crop fairly even.

11. Improved White Globe (Sutton).—Bulb of medium size; fairly solid; outer skin golden brown, inner greenish yellow. Crop even. Almost coconut-shaped.

8. Main Crop (R. Veitch).—Bulb of medium size; fairly solid; outer skin rather deep straw, inner greenish yellow. Crop, rather uneven. Some flattish.

9. Main Crop (Dobbie).—Bulb medium to large; solid; flattish oval; outer skin golden straw, inner greenish yellow. Crop fairly even.

16. Perfection (Sutton).—Crop even. See No. 41, Autumn-sown Onions; but the latter were darker in colour.

27. Prize Brown Globe (E. W. King).—Bulb of medium size; rather loose; outer skin brown straw, inner greenish yellow. Crop fairly even.

24. Sandy Giant (Gray).—Bulb of medium size, fairly solid; outer skin brown straw, inner greenish yellow. Stock mixed and thick-necked.

15. The Sutton Globe (Sutton).—Crop even. See No. 25, Autumn-sown Onions.

28. Trebons (R. Veitch).—Crop even. See Nos. 32 and 33, Autumn-sown Onions.

25, 26. Up-to-Date (Nutting, Gray), No. 26, **XX** September 28, 1917.—Crop even. See No. 24, Autumn-sown Onions.

III. Brown Varieties.

(a) *Bulbs flat.*

37. Sandy Gem (Gray).—Bulb medium; fairly solid; outer skin brown, inner yellowish green. Crop, fairly even. Rather thick-necked.

(b) *Bulbs oval.*

43. Brown Globe (R. Veitch).—Crop fairly even. See No. 72, Autumn-sown Onions.

36. Early Gem (Sutton).—Bulb of medium size, rather loose; outer skin brown, inner yellowish green. Crop rather uneven.

30. James' Keeping (R. Veitch).—Crop fairly even. See No. 76, Autumn-sown Onions.

42. Long-Keeping (Sutton).—Crop rather uneven. See No. 75, Autumn-sown Onions.

IV.—Red Varieties.

(a) *Bulbs flat.*

40. Selected Red (Dobbie).—Bulb medium; fairly solid; outer skin, shining purplish red, inner red-purple, whitish base; flesh white, streaked towards margin. Crop fairly even.

(b) *Bulbs oval.*

39. Blood Red Large Globe (Nutting).—Bulb medium; rather loose; outer skin shining purplish red, inner red-purple, whitish base; flesh white, slightly streaked at apex. Crop uneven.

38. Giant Red Rocca (Sutton).—Bulb medium; fairly solid; some coconut; outer skin shining purplish red, inner shining pale red-purple; flesh white, streaked towards margin. Crop fairly even. Three brown rogues.

BROAD BEANS AT WISLEY, 1917.

FORTY-NINE stocks of Broad Beans were included in the trials in 1917, among them being some which had gained awards in earlier trials, and which were added for comparison with the newer comers. The ground in which they were grown was double-dug and well manured in the previous autumn, and the seed was sown on March 16 in double rows 9 inches apart and zigzagged, the seeds being 12 inches apart. Three feet separated one double row from the next. Germination and growth were good in all varieties, but a check was imposed by a severe attack of the bean weevil (*Sitones lineatus*), but after this had been overcome growth again developed well. Only one plant was attacked by the black fly, and the prompt removal of this prevented its spread. The set of pods was not good, only the early flowers producing pods as a rule; these, however, developed well in every case.

The Vegetable Committee inspected the Trial on July 6 and recommended the following awards:

Award of Merit.

5. Broad Windsor (Dobbie).
26. Exhibition Longpod (Dobbie).
43. Green Giant (Sutton).

Highly Commended (**XXX**).

22. Erdington Gem (Holder & Tilt).
1. Giant Windsor (Sutton).
41. Green Leviathan (Carter).
10. Green Windsor (Sutton).
2. Mammoth Windsor (Carter).
25. Prizetaker Exhibition Longpod (Bunyard).
33. Prolific Longpod (Sutton).

Commended (**XX**).

39. Invicta (Nutting).
8. Market Garden Windsor (Carter).

Besides those indicated above as having received awards in earlier trials, the following which had previously received awards were represented:

17. Champion Longpod, **A.M.** July 1, 1897 (Dobbie).
28. Exhibition Longpod, **A.M.** July 1, 1897 (R. Veitch).
40. John Harrison, **A.M.** July 24, 1883 (Laxton).
34, 35. Leviathan, **A.M.** June 30, 1908 (Carter).
18. Mammoth Longpod, **F.C.C.** July 10, 1894 (Carter).
14, 15. Seville Longpod, **F.C.C.** July 10, 1874 (Vilmorin).

There was little difference in the time at which the different varieties of beans were fit to pick, but the following were ready on June 25 Nos. 1, 6, 7, 8, 14, 15, 16, 17, 19, 21, 23, 29, 31, 32, 35, 42, the remainder maturing within about four days.

The varieties are grouped under 'Broad Windsor' types, with broad, almost round seeds and short pods, usually broadest towards the end, containing few seeds; 'Longpod' types with longer pods, typically containing a greater number of usually smaller seeds; and 'Fan' types with several smaller, more or less clustered pods in place of the one or two of the other types and smaller seeds. Each of these is again divided into white- and green-seeded types.

VARIETIES.

1.* Giant Windsor.
2. Mammoth Windsor.
3. Windsor Giant Four-seeded.
4. Taylor's Large Windsor.
5. Broad Windsor.
6., 7. Colossal Windsor.
8., 9. Market Garden Windsor.
10. Green Windsor.
11. Improved Long Green Windsor.
12., 13. Aquadulce.
14., 15. Seville Longpod.
16. Early Longpod Selected.
17. Champion Longpod.
18. Mammoth Longpod.
19. Mackie's Monarch.
20. Monarch.
21. Eclipse Longpod.
22. Erdington Gem.
23., 24. Exhibition Longpod, Bunyard's.
25. Prizetaker Exhibition Longpod, Bunyard's.
26., 27., 28. Exhibition Longpod Dobbie's, Sutton's, Veitch's.
29. The Cropper.
30. Invicta.
31. Prizetaker, White.
32. Prizetaker, Kelway's.
33. Prolific Longpod.
34., 35. Leviathan.
36. Monstrous Longpod.
37. Sword or Turkey.
38. Hangdown.
39. Invicta.
40. John Harrison.
41. Green Leviathan.
42. Long Green Exhibition.
43. Green Giant.
44. Green Longpod.
45. Mammoth New Green Longpod.
46. Olympic Green Longpod.
47. Dwarf White Fan or Royal Cluster.
48. Early Mazagan.
49. Beck's Green Gem.

I. BROAD WINDSOR.

(a) *White Seeded.*

5. Broad Windsor (Dobbie), **A.M.** July 6, 1917.—Height 3 feet 6 inches; haulm strong, of medium green; pods of medium green, mottled brown, 6 to 8 inches in length, broad, curved, 4 to 7 in group; seeds large, broad, 4 to 6 in pod. Ready June 27. Crop heavy.

6, 7. Colossal Windsor (Barr, Carter).—Height 2 feet 9 inches to 3 feet; haulm strong, some branching, of medium green; pods light green, mottled brown, 5 to 6 inches in length, broad, curved, 4 to 6 in group; seeds large, broad, 3 to 4 in pod. Ready June 25. Crop fairly heavy. Raised by Messrs. J. Carter between 'Aquadulce' and 'Old Harlington Windsor' (1903).

1. Giant Windsor (Sutton), **XXX** July 6, 1917.—Height 3 feet 3

* See footnote, p. 107.

inches; haulm strong, some branching, light green; pods light green, mottled brown, 5 to 7 inches in length, broad, curved, 4 to 6 in group; seeds large, broad, 3 to 4 in pod. Pods less well-filled than No. 5. Ready June 25. Crop heavy. A selection from 'Windsor.'

2. Mammoth Windsor (Carter), **XXX** July 6, 1917.—Height 3 feet 3 inches; haulm of medium strength with few branches, of medium green; pods light green, mottled brown, 6 to 8 inches in length, broad, fairly straight, 4 to 6 in group; seeds large, broad, 3 to 4 in pod. Ready June 27. Crop heavy. Raised by Messrs. J. Carter between 'Seville Longpod' and 'Harlington Windsor' (1897).

8, 9. Market Garden Windsor (Carter, Barr), No. 8, **XX** July 6, 1917.—Height 2 feet 6 inches to 3 feet; haulm strong, some branching, of medium green; pods of medium green, mottled brown, 4 to 6 inches in length, broad, curved, 5 to 8 in group; seeds large, broad, with white eye, 5 to 8 in pod. Ready June 29. Crop heavy. A white-seeded selection from 'Dutch Longpod' (Messrs. Carter, 1899).

4. Taylor's Large Windsor (Barr).—Height 3 feet; haulm fairly strong, a few branching, light green; pods light green, mottled brown, 4 to 5 inches in length, broad, curved, 6 to 9 in group; seeds large, broad, 3 to 4 in pod. Ready June 28. Crop heavy.

3. Giant Four-seeded Windsor (Barr).—Height 3 feet; haulm of medium strength, a few branching, of medium green; pods light green, mottled brown, 5 to 7 inches in length, shape various, 4 to 6 in group; seeds, some broad, some narrow, 3 to 6 in pod. Irregular in foliage and pod; not quite true. Ready June 27. Crop medium.

(*b*) *Green Seeded.*

10. Green Windsor (Sutton), **XXX** July 6, 1917.—Height 3 feet; haulm strong, some branching, medium to dark green; pods medium green, mottled brown, 5 to 5½ inches in length, broad, curved, 5 to 8 in group; seeds large, broad, 3 to 4 in pod. Ready June 27. Crop heavy. A selection from 'Green Windsor.'

11. Improved Long Green Windsor (Barr).—Height 3 feet 3 inches; haulm strong, some branching, of medium green; pods of medium green, mottled brown, 4 to 5 inches in length, broad, curved, 5 to 8 in group, seeds large, broad, 3 to 4 in pod. Ready June 29. Crop fairly heavy. A selection from 'Green Harlington.'

II. Longpod Types.

(*a*) *White Seeded.*

12, 13. Aquadulce (R. Veitch, Barr).—Height 1 foot 9 inches to 2 feet; haulm weak, some branching, of medium green; pods of medium green, mottled brown, 5 to 8 inches in length, medium width, mostly straight, 3 to 6 in group; seeds large, long, 3 to 6 in pod. Pods variable, some broad. Ready June 27. Crop medium.

17. Champion Longpod (Dobbie).—Height 2 feet 6 inches; haulm

fairly strong, some branching, of medium green; pod of medium green, mottled brown, 5 to 7 inches in length, of medium width, mostly straight, 5 to 7 in group; seeds large, long, 4 in pod. Ready June 25. Crop medium.

16. Early Longpod, Selected (Barr).—Height 2 feet 9 inches; haulm fairly strong, a few branching, of medium green; pod of medium green, slightly mottled brown, 5 to 7 inches in length, both straight and curved, 4 to 7 in group; seeds variable in size and shape, 2 to 5 in pod. Not true. Ready June 25. Crop medium.

21. Eclipse Longpod (Sydenham).—Height 2 feet 9 inches; haulm strong, a few branching, of medium green; pods of medium green, mottled brown, 6 to 8½ inches in length, straight and slightly curved, of medium width, 4 to 6 in group; seeds large, long, 4 to 5 in pod. Ready June 25. Crop heavy.

22. Erdington Gem (Holder & Tilt), **XXX** July 6, 1917.—Height 3 feet; haulm strong, a few branching, of medium green; pod rather deep green, 6 to 10 inches in length, slightly curved, of medium width, 4 to 7 in group; seeds fairly large, long, 5 to 7 in pod. Ready June 27. Crop heavy. Raised by senders by crossing 'Bunyard's Exhibition' with 'Harlington.'

23, 24. Exhibition Longpod, Bunyard's (Simpson, Barr).—Height 3 feet; haulm strong, some branching, of medium green; pods of medium green, mottled brown, 6 to 7 inches in length, of medium width, straight and slightly curved, 5 to 7 in group; seeds of medium size, long, 4 to 6 in pod. Ready July 26. Crop fairly heavy.

26. Exhibition Longpod, Dobbie's (Dobbie), **A.M.** July 6, 1917.—Height 3 feet 3 inches; haulm strong, some branching, of medium to darker green; pod rather dark green, some mottled brown, 8 to 10 inches in length, slightly curved, of medium width, 4 to 5 in group; seeds large, wide, 5 to 6 in pod. Ready June 27. Crop heavy.

27. Exhibition Longpod, Sutton's (Sutton).—Height 3 feet 3 inches; haulm strong, a few branching, of medium green; pod rather dark green, some mottled brown, 7 to 9 inches in length, curved, of medium width, 4 to 6 in group; seeds long, of medium width, variable, 5 to 6 in pod. Ready June 27. Crop fairly heavy.

28. Exhibition Longpod, Veitch's (R. Veitch).—Height 3 feet; haulm of medium strength, a few branched, of medium green; pod dark green, some mottled brown, 5 to 7 inches in length, slightly curved, of medium width, 5 to 7 in group; seeds long, of medium width, 4 to 5 in pod. Ready June 29. Crop medium.

38. Hangdown (Barr).—Height 3 feet; haulm of medium strength, some branched, of medium green; pod dark green, some mottled brown, 5 to 7 inches in length, straight and curved, 4 to 8 in group; seeds long, of medium width, 4 to 6 in pod. Ready June 29. Crop fairly heavy.

30, 39. Invicta (Barr, Nutting), No. 39, **XX** July 6, 1917.—Height 3 feet 9 inches; haulm of medium strength, a few branched, light and medium green; pod dark green, some mottled, 6 to 9 inches in

length, curved, 4 to 7 in group; seeds long, of medium width, 4 to 7 in pod. Ready June 28. Crop fairly heavy. No. 30 had some broad pods.

40. John Harrison (Harrison).—Height 2 feet 9 inches; haulm fairly strong, some branched, of medium green; pod dark green, mottled brown, 5 to 7½ inches in length, variable, straight and curved, 4 to 7 in group; seeds long, of small and medium size, 4 to 7 in pod. Ready June 27. Crop medium. Variable, some narrow pods. Raised by Messrs. Harrison.

34, 35. Leviathan (Carter, Barr).—Height 2 feet to 2 feet 10 inches; haulm fairly strong, some branching, of medium green; pod medium to dark green, some mottled brown, 4 to 9 inches in length, slightly curved, of medium width, 4 to 6 in group; seeds large, long, 4 to 8 in pod. Ready June 26. Crop heavy. No. 35 was much the poorer stock. Raised by Howe of Darlington between 'Aquadulce' and 'Bunyard's Exhibition,' introduced by Messrs. Carter.

19. Mackie's Monarch (Barr).—Height 2 feet 9 inches; haulm strong, some branching, of medium green; pod of medium green, mottled brown, 6 to 8 inches in length, straight, of medium width, 4 to 6 in group; seeds long, of medium width, 5 to 6 in pod. Ready June 25. Crop heavy.

18. Mammoth Longpod (Sutton).—Height 2 feet 3 inches; haulm rather weak, some branched, of medium green; pod of medium green, mottled brown, 5 to 6 inches in length, mostly straight, of medium width, 4 to 6 in group; seeds large and long, 5 to 6 in pod. Ready June 27. Crop fairly heavy. A selection from Seville type.

20. Monarch (Barr).—Height 2 feet 9 inches; haulm strong, some branching, of medium green; pod of medium green, mottled brown, 5 to 7 inches in length, straight or slightly curved, of medium width, 5 to 7 in group; seeds long, of medium width, 4 to 5 in pod. Ready June 29. Very like No. 19, but pods more erect.

36. Monstrous Longpod (Barr).—Height 2 feet 9 inches; haulm strong, of medium green; pod dark green, mottled brown, 6 to 8 inches in length, curved, of medium width, 4 to 6 in group; seeds large and long, 4 to 6 in pod. Ready June 27. Crop heavy.

32. Prizetaker, Kelway's (Barr).—Height 1 foot 9 inches; haulm rather weak, some branching, light green; pod of medium green, some mottled brown, 5 to 7 inches in length, straight, some slightly curved, 4 to 6 in group; seeds long, of medium width, 4 to 6 in pod. Ready June 25. Crop fairly heavy. Pods rather soft.

25. Prizetaker Exhibition Longpod (Bunyard), **XXX** July 6, 1917.—Height 3 feet; haulm strong, some branching, of medium green; pod of medium green, mottled brown, 7 to 9 inches in length, curved, of medium width, 5 to 7 in group; seeds large, long, 5 to 6 in pod. Ready June 27. Crop fairly heavy.

31. Prizetaker White (Barr).—Height 3 feet to 3 feet 6 inches; haulm fairly strong, some branched, light green; pod dark green

mottled brown, 7 to 9 inches in length, curved, 4 to 6 in group; seeds long, of medium width, 5 to 7 in pod. Ready June 25. Crop fairly heavy.

33. Prolific Longpod (Sutton), **XXX** July 6, 1917.—Height 3 feet; haulm strong, a few branched, of medium green; pod of medium green, some mottled brown, 6 to 8 inches in length, curved, of medium width, 3 to 6 in group; seeds large and fairly wide, 4 to 6 in pod. Ready June 27. Crop heavy.

14, 15. Seville Longpod (Barr, R. Veitch).—Height 1 foot 9 inches; haulm weak, some branching, of medium green; pods of medium green, slightly mottled brown, 5 to 7 inches in length, straight and curved, 4 to 7 in group; seeds large, long, 3 to 5 in pod. Ready June 25. Crop medium, No. 15 rather poor.

37. Sword or Turkey (Barr).—Height 2 feet 9 inches; haulm fairly strong, a few branched, of medium green; pods dark green, some mottled brown, 5 to 9 inches in length, straight, some slightly curved, 4 to 7 in group; seeds long, of medium width, 4 to 5 in pod. Ready June 29. Crop medium.

29. The Cropper (Bell).—Height 2 feet 9 inches; haulm of medium strength, branched, light green; pods of medium green, some mottled brown, 6 to 8 inches in length, curved, 4 to 6 in group; seeds long, of medium width, 4 to 6 in pod. Ready June 25. Crop medium. Raised between 'Aquadulce' and 'Bunyard's Exhibition' by Mr. David Bell.

(*b*) *Green Seeded.*

43. Green Giant (Sutton), **A.M.** July 6, 1917.—Height 3 feet 3 inches; haulm strong, a few branched, of medium green; pods dark green, some slightly mottled brown, 7 to 9 inches in length, fairly straight, of medium width, 5 to 8 in group; seeds long, of medium width, 5 to 7 in pod. Ready June 27. Crop heavy. A selection from 'Green Longpod.'

44. Green Longpod (Sutton).—Height 2 feet 9 inches; haulm strong, of medium green; pod dark green, some mottled brown, 5 to 7 inches in length, curved, of medium width, 5 to 7 in group; seeds large, long, 4 to 5 in pod. Ready June 27. Crop fairly heavy.

41. Green Leviathan (Carter), **XXX** July 6, 1917.—Height 2 feet 9 inches; haulm strong, some branching, of medium green; pod dark green, some mottled brown, 6 to 7 inches in length, curved, of medium width, 4 to 7 in group; seeds long, of medium width, 4 to 7 in pod. Ready June 29. Crop heavy. A selection from 'Leviathan.'

42. Long Green Exhibition (Barr).—Height 2 feet 6 inches; haulm variable in strength, some branched, lightish green; pod dark green, some mottled brown, 5 to 6 inches in length, straight, of medium width, 5 to 6 in group; seeds long, of medium width, 3 to 4 in pod. Ready June 25. Crop medium. A few with curved pods.

45. Mammoth New Green Longpod (Barr).—Height 3 feet; haulm

fairly strong, some branched, of medium green; pod dark green, 4 to 8 inches in length, straight and curved, of medium width, 5 to 12 in group; seeds small and medium, 2 to 4 and 6 in pod. Ready June 27. Crop medium. Not true, variable, short and long pods, not more beans in long ones. A selection from 'Green Longpod.'

46. Olympic Green Longpod (Simpson).—Height 3 feet; haulm fairly strong, some branched, of medium green; pod dark green, some mottled brown, 6 to 8 inches in length, curved, of medium width, 3 to 5 in group; seeds long, of medium width, 5 to 6 in pod. Ready June 27. Crop medium.

III. Dwarf Fan-Podded Types.

(a) *White Seeded.*

47. Dwarf White Fan or Royal Cluster (Barr).—Height 1 foot 6 inches to 2 feet; haulm rather weak, branched, light green; pod dark green, 3 to 4 inches in length, nearly straight, narrow, 8 to 12 in group; seeds small, roundish, 2 to 3 in pod. Ready June 27. Crop fairly heavy. Small foliage, pods in fan shape, small, upright.

48. Early Mazagan (Barr).—Height variable, 1 foot 6 inches to 3 feet 6 inches; haulm fairly strong, some branched, light green; pod of medium green, 3 to 4½ inches in length, nearly straight, 8 to 15 in group; seeds small, roundish, 2 to 3 in pod. Ready June 29. Crop medium. Small foliage, pods in fan shape, small, upright.

(b) *Green Seeded.*

49. Beck's Green Gem (Barr).—Height 18 inches to 2 feet; haulm rather weak, branching, light green; pod dark green, 2½ to 3 inches in length, nearly straight, narrow, 8 to 15 in group; seeds small, roundish, 2 to 3 in pod. Ready June 27. Crop fairly heavy. Small foliage, pods in fan shape, small, upright.

ESCHSCHOLZIAS AT WISLEY, 1917.

FORTY stocks of Eschscholzias were received for trial in 1917. They were sown in rows one foot apart on March 28, on ground which was not manured this season. They all germinated well and were thinned to 9 inches between the plants as soon as large enough.

The Floral Committee examined them on two occasions and selected as the best in the trial, recommending awards as indicated :—

Award of Merit.

Nos. 17, 18. crocea Mandarin (**F.C.C.** 1887).
Nos. 19, 23. Mikado (**A.M.** 1908).

Highly Commended (**XXX**).

No. 8. Golden West.
No. 11. Orange King.
Nos. 24, 25, 26. Chrome Queen.

VARIETIES.

1. *californica alba fl. pl.
2. crocea fl. pl.
3. crocea double.
4. crocea fl. pl. Improved.
5. Orange Queen.
6. californica alba.
7. californica.
8. Golden West.
9. fimbriata.
10. crocea aurantiaca.
11., 12., 13. Orange King.
14., 15. The Geisha.
16. Mandarin.
17. crocea compacta Mandarin.
18. Mandarin Improved.
19., 20., 21. Mikado.
22. californica caniculata Mikado.
23. Mikado Improved.
24., 25., 26. Chrome Queen.
27., 28. Diana.
29. Rosy Dawn (syn. intus roseus).
30. compacta intus roseus.
31. crispa (syn. Rosy Morn).
32. Rose Cardinal.
33., 34. Fireflame.
35. The Rajah.
36. Carter's Rajah.
37. Thorburni.
38. Carter's Hybrids.
39. Mikado canaliculata.
40. Carmine King.

(a) *Creamy White.*

6. californica alba (Barr).—Height 18 inches; flowers 1½ to 3 inches, single; petals entire or slightly notched. Needs further selection.

1. californica alba fl. pl. (Barr).—Height 9 to 12 inches; habit fairly compact; flowers 1½ to 2 inches; single and semi-double.

* See footnote, p. 107.

(b) Chrome, deeper at base, lighter outside.

24, 25, 26. Chrome Queen (R. Veitch, Barr, Watkins & Simpson), **XXX** July 5, 1917.—Height 16 to 18 inches; flowers 2 to 2¾ inches; single.

(c) Chrome with Orange Base.

7. californica (Barr).—Height 18 to 20 inches; flowers 2 to 3 inches; single; mixed with orange.

9. fimbriata (Barr).—Height 16 to 18 inches; foliage reddish; flowers 1½ to 2 inches; single or semi-double; petals fimbriated in some plants, in others normal; mixed, orange, orange and brown, &c.

8. Golden West (Barr), **XXX** July 5, 1917.—Height 18 to 20 inches; foliage reddish; flowers 2 to 3 inches; single.

(d) Orange.

10. crocea aurantiaca (Barr).—Height 20 to 22 inches; very free-flowering; flowers 2 to 3 inches; single; mixed with chrome, orange base.

2, 3, 4, 5, crocea fl. pl. (Barr, R. Veitch, Watkins & Simpson, Barr), **F.C.C.** July 3, 1877.—Height 16 to 18 inches; flowers 1½ to 2¼ inches; single and semi-double. No. 5 was sent in as Orange Queen.

11, 12, 13. Orange King (Watkins & Simpson, R. Veitch, Barr), No. 11, **XXX** July 20, 1917.—Height 16 to 18 inches; very free-flowering; flowers 2 to 3 inches; single. Nos. 12 and 13 not so good as stock 11.

(e) Crimson-brown outside, orange, streaked crimson-brown inside.

16, 17, 18. crocea compacta Mandarin (Barr, Sydenham, Barr), **F.C.C.** July 3, 1887; Nos. 17 and 18, **A.M.** July 20, 1917.—Height 18 to 20 inches; flowers 1½ to 3 inches; single; petals crenate. No. 16 was sent under this name, but was very mixed in colour and wrongly named.

14, 15. The Geisha (Barr, Carter), **A.M.** August 13, 1915.—Height 12 to 14 inches; flowers 2 to 2½ inches; single; petals fluted, some toothed.

(f) Crimson-brown with orange base.

19, 20, 21, 22, 23, 39. californica canaliculata Mikado (Carter, Barr, R. Veitch, Hurst, Barr, Gardiner), **A.M.** June 23, 1908; Nos. 19 and 23, **A.M.** July 20, 1917.—Height 12 to 18 inches; flowers 2 to 3 inches; single; some petals fluted; flowering June 14. Nos. 20, 21, 22, 39 mixed in colour. No. 23 was sent in as Mikado Improved.

(g) Rosy-pink outside, chrome-white inside.

27, 28. Diana (Barr, Carter).—Height 21 to 23 inches; flowers 2½ to 3½ inches; single; petals fluted. No. 27 mixed for fluting.

(h) Rosy carmine.

29. compacta Rosy Dawn (Barr).—Height 18 to 20 inches; flowers 2½ to 3 inches; single.

30. compacta intus roseus (Sydenham).—Like 29, but not quite true to colour.

(i) Rosy-purple outside, whitish inside.

31. crispa (syn. Rosy Morn) (Barr).—Height 16 to 18 inches; flowers 2 to 2¾ inches; single; petals fluted. Mixed lemon and orange. Very like No. 32.

(j) Rosy-purple outside, blush inside.

32. Rose Cardinal (Barr).—Height 16 to 18 inches; flowers 2 to 2¾ inches; single; petals fluted. Very like No. 31.

(k) Purple-carmine, ivory base.

35, 36. The Rajah (Barr, Carter).—Height 17 inches; flowers 2 inches; single; edges of inner petals slightly incurved.

40. Carmine King (Gardiner).—Height 16 inches; flowers 2 to 2½ inches; single; petals slightly fluted. One orange rogue and one very pale mauve.

(l) Crimson-brown outside, orange suffused crimson-brown inside.

33, 34. Fireflame (Barr).—Height 12 to 18 inches; flowers 2 to 3 inches; single; petals slightly fluted. No. 33 had one plant dwarf (9 inches); flowers 1¾ to 2 inches; bell-shaped; dull rosy-carmine outside, streaked yellowish-white inside.

37. Thorburni (R. Veitch).—Height 15 inches; flowers 2½ to 3 inches; single; petals slightly fluted; similar to 'Fireflame' but foliage generally smaller.

(m) Mixed colours.

38. Hybrids (Carter).—Height 18 inches; flowers 2 to 2½ inches; single; mixed, crimson-orange, rosy carmine, and brownish-carmine.

NATIONAL DIPLOMA IN HORTICULTURE.

THE third Final and the fourth Preliminary Examinations for Professional Gardeners for the National Diploma in Horticulture took place in June 1917. The number of candidates was small owing to the war, five only offering themselves for the Final Examination, viz. three in Section I. (General Horticulture), of whom two passed, and one each in Section V. (Landscape Gardening) and Section VII. (Horticultural Inspection), who both attained the pass standard. Fifteen candidates sat for the Preliminary Examination, but the standard reached by the majority was not a high one, and only four passed.

It cannot be too widely recognized that the standard set at these examinations is a high one and the tests searching. Only those who have had a fairly wide experience and have thoroughly prepared themselves have a chance of success.

The list of successful candidates is given below.

LISTS OF SUCCESSFUL CANDIDATES.

FINAL EXAMINATION.

Section I.

Thrupp, H. M. B.
Heron, M.

Section V.

Woolley, R. V. G.

Section VII.

McIvor, D. G.

F. J. CHITTENDEN, F.L.S.
W. CRUMP, V.M.H.
A. G. L. ROGERS.
T. STEVENSON.
EDWARD WHITE.
} *Examiners.*

PRELIMINARY EXAMINATION.

Herring, L. K.
Joshua, L. H.
Oldham, C. H.
Thornton, E. R.

F. J. CHITTENDEN, F.L.S.
W. CRUMP, V.M.H.
T. STEVENSON.
} *Examiners.*

EXAMINATION OF SCHOOL TEACHERS IN COTTAGE AND ALLOTMENT GARDENING.

APRIL 18, 1917.

SIX hundred and fifteen candidates entered for the Examination held on April 18, 1917. Of these, 27 obtained a first class, 296 a second, and 232 a third, leaving 36 failures (including one who only answered one question in Section B and who would otherwise have appeared in the list) and 24 absentees.

The Examiners (Mr. F. J. Chittenden, F.L.S., Mr. John Fraser, F.L.S., Mr. W. Crump, V.M.H., and Mr. C. R. Fielder, V.M.H.) report that many candidates advocated burning the turf, forgetting that this would destroy most of its manurial value. The proportions of ground to be devoted to various crops were generally well set forth; but there was much lack of knowledge of the quantities of the different seeds required for cropping it. There was better knowledge of Rotation and Intercropping than of Successional Cropping.

The knowledge of insects was, for the most part, clearly that obtained from books, and, as a result, there was but little known as to the best methods of destroying them. There was the usual confusion as to annuals, which were made to include bulbous plants and perennials. There were some excellent answers on how to break up pasture land for potatos, and also on hardy fruits and methods of storing them.

Only a few of the answers in Section B were really well done. The question on "sticky" soils was mostly avoided, although a proper understanding of their character lies at the root of gardening on all clay soils. The question relating to lime was better handled, but a few candidates still fail to distinguish between the various forms of lime, and persist in regarding superphosphate of lime as of value in the soil in the same way as quick or slaked lime, or carbonate of lime.

The Examiners cannot but regret the failure of almost all candidates to base their methods on ascertained facts of plant and animal life, and also the tendency to substitute rule of thumb and memorized text-book statements for reasoned answers to the questions asked. This is nowhere more apparent than in the answers concerning plant pests.

Notwithstanding the notice af the top of each sheet of the foolscap paper block, many candidates omitted to commence each question on a fresh sheet. This causes much extra trouble and delay in despatching the answers to the different examiners. Also, candidates should answer each question fully and independently of any other

answer, and not refer the examiner to an answer given to another question, which may be miles away in the hands of another examiner for marking.

W. WILKS, *Secretary R.H.S.*

Class I.

1. Fidler, A. S., 3 Cresselly Villas, Mountain Ash.
2. Bull, A. R., School House, Culmstock.
   Dix, H., Loscoe Road Council School, Heanor.
4. New, F. W., The Cabin, Park Road, Cheam.
5. Harries, J. D., 99 Court Road, Cadoxton.
6. Watson, B. J., The Cottage, Eastnor.
   Wyatt, F. C., 2 Oxford Street, Burnham.
8. Watkins, T. J., Cefn Forest School, Pengam.
9. Killick, E. W. J., Aldringham.
10. Loyn, G. M., Colfadail, Llanrhystyd.
    Thomas, W., Post Office, Tairgwaith.
12. Adams, C. G., The School, Collingbourne Ducis.
13. Griffiths, E. O., Glanbrenig, Tregaron.
    Moakes, Miss L., Clay Bank Farm, Earlswood.
15. Battison, G., 8 Holyoake Terrace, Long Buckby.
16. Eden, Miss M., 3 Catherine Street, Crewe.
    Willcox, Miss A. P., 18 Elmdale Road, Clifton.
18. Goodison, E., " Knighton," Whiteley Wood Road, Ecclesall.
    Heal, Miss L., School House, How Caple.
    Leavesley, H., School House, Monkton Farleigh.
    Summers, A. D., " Hazeldene," Drayton.
    Westcott, J. R., School House, Bridestowe.
    Wetherall, J. A., " Sunnyside," Ashbourne.
24. Davis, Miss M. L., 36 Strathyre Avenue, Norbury.
    Pearson, H., School House, Lea.
    Sanders, A., 140 Ivanhoe Street, Scott's Green.
    Wybrow, W., School House, Swyncombe.

Class II.

1. Fuller, Miss K. E., 1 Harbord Street, Fulham.
   Hocking, T. O., Munslow School, Craven Arms.
3. Ashby, C. A., Lyndhurst, Broseley.
   Boyer, M., 19 Welsh Row, Nantwich.
   Little, W. B., 1 Halse Road, Brackley.
   Sutcliffe, M., 231 Willow Mount, Sowerby Bridge.
7. Cawley, J. H., 47 John Street, Longbridge Hayes.
   Chadwick, A. J., Copstow Villas, Tean.
   Daniell, Miss F., Bilston Green, Cinderford.
   Evans, J., School House, Cilgerran.
   Faulkner, G., School House, Knowle.
   Kent, Miss E., 12 Winstanley Road, Sheerness.

13. Ball, Mrs. F., St. James School, Halesworth.
Edgell, H. C., Council School, Radstock.
15. Brooks, R. B., School House, Keelby.
Coombe, R. H., Bishop Wordsworth's School, Salisbury.
Gilby, H. J. (Sgt.), 3rd London General Hospital, Wandsworth.
Henn, Miss D. E., Pitchford, Condover.
Moore, Mrs. E. A., School House, Long Melford.
20. Dewhirst, Miss A. E., 21 Marlborough Road, Shipley.
Marmion, J., 13 Alexandra Road, Birkenhead.
Vial, A. E. L., 5 Dulverton Road, Leicester.
Walpole, G. W., "Talgarth," Llanvaches.
Wilkinson, S. T., "Enfield," South Avenue, Coventry.
Woodward, G. H., 32 Emily Street, West Bromwich.
26. Bates, F. O., 126 Sandwell Street, Walsall.
Benbow, G. F., 114 New River Crescent, Palmers Green.
Crickard, F. J., 24 Blagdon Road, New Malden.
Fuke, J. B., Synton House, Moretonhampstead.
Hallam, H. M., 116 Radford Boulevard, Nottingham.
Jennings, A. J., 63 Walsgrave Road, Coventry.
Mack, J. H., London Street, Swaffham.
Royston, G., Silver Street, Willingham.
Townsend, Miss I. G., School House, South Ockendon.
35. Mallin, Mrs. L., School House, Broome.
Manning, Miss L., New Street School, Cambridge.
Perkins, F. H., Industrial School, Desford.
Phillips, Miss L. E., Barton Road, Bournemouth.
Potter, F., 45 Gordonbrock Road, Brockley.
Sibley, D. W., 55 School Street, Church Gresley.
Thomas, Mrs. S. E., 31 Waldegrave Road, Teddington.
Williams, Miss E. E., 303 Church Road, St. George.
Wood, E., School House, Pant Glas.
44. Ballard, Miss S. J., School House, Chearsley.
Band, D., 51 Craigie Road, Perth.
Harrison, W. W., School House, Langwith.
Kent, J., 45 Mellows Road, Wallington.
Rissen, Miss E. F., 30 Eastbury Avenue, Barking.
Taylor, H. E., 309 Burntwood Lane, Wandsworth.
Thompson, H., Ivydene Villa, Barton-on-Humber.
Westcott, W., "Garfield," Pinhoe.
52. Blacklee, A. P., North House, Mistley.
Bolton, Miss M., 72 Margaret Grove, Harborne.
Ellis, Miss E., 16 Beacon Lane, Horton Bank Top.
Nichols, L., Castlethorpe, Stony Stratford.
Shoebridge, Miss C. L., 3 Park Grove, Bromley.
White, P. G., Hilldrop Villa, Helions Bumpstead.
58. Bryning, J. W., Holm View, Watchet.
Cheetham, Miss C. A., Porth-y-gan, Wrexham.
Ellis, Miss M. G., 13 Dorville Road, Lee.

Fettes, J. M., 10 Ellen Terrace, New Washington.
Hext, Mrs. E. M., School House, Yarnscombe.
Hinchcliffe, Miss W. A., Blidworth, Mansfield.
Pascoe, Miss H. A., "Restcote," Soham.
58. Quarmby, J. A., Holly Bank, Greetland.
Skerrey, E. W., 5 Cromwell Terrace, King's Lynn.
Turton, W., 10 Market Street, Little Lever.
Wheeler, F. H., 11 West Street, Southend.
Williams, W. R. A., Cambrian House, Newtown.
Aubrey, D., 31 Aberdeen Road, Wealdstone.
Conder, Miss W. M., 57 Church Hill, Royston
Fletcher, L., The Lydiates, Kinver.
Hall, Miss H., 2 Polam Avenue, Darlington.
Manning, Mrs. F. E., Dorstone, Hereford.
Preston, W., School House, Lewknor.
70. Ryder, Miss L. E., Tittensor.
Shambrook, C. J., 46 Colesburg Road, Beckenham.
Squire, Miss E. A., Training College, Norwich.
Suckling, Miss L. M., 57 Eagle Road, Wembley.
Warren, C. D., 63 Comer Gardens, Worcester.
Weaver, Miss M., 12 Reedville, Claughton.
Carey, J. O., Stradbally Boys' School, Queen's County, Ireland.
Cox, F. L., Gordon Place, Littleport.
Crofts, Miss I., 20 Avenue Road, Southend.
Evans, L. N., 4 Maengwyn Villas, Machynlleth.
Goode, E. A., Princes Road, Cheltenham.
82. Houghton, E. H., 26 Sopers Grove, Basingstoke.
James, J., Gwynfe Council School, Llangadock.
Jarman, D. T., Derlwyn, Ynysybwl.
Ryan, Mrs. M. A., Fair View, St. John's, Isle of Man.
Straw, W., 102 Market Place, Worksop.
Clay, F. A., 7 Ellesmere Avenue, Lincoln.
Davey, F. W., School House, Burnham Market.
92. Foster, S. J., Colley Elm, Southey.
Gaddard, Miss E. E., School House, Westbury.
Kirk, Miss A., 14 Weardale Street, Wheatley Hill.
Rhodes, Miss C., 19 Rochester Terrace, Headingley.
Alexander, T. C., Upper Leyton, Tintern.
Blencowe, J. C., 21 Church Street, Pembroke Dock.
Burke, Miss M. M., 18 Wynyard Grove, Gilesgate.
Coster, Miss E. L., Moor Lane, Rickmansworth.
Cumberland, A., 82 Belvedere Road, Burton.
98. Earle, B. V., Watchet, Somerset.
Hande, W. J., Boys' School, Ballinakill, Ireland.
Jenkins, A. J., Dunraven House, Penclawdd.
Johnson, Mrs. M., School House, Bowers Gifford.
Lowery, J. H., "St. Hilda," Hednesford.
Marsh, Miss E. M., Highfield Villa, Thatto Heath.

Mead, A., Ferry View, Bourne End.
Walton, Miss J. A., 3 Midland Terrace, Pleasley.
98. Watkins, F. J. H., Kingswood, Melksham.
Wilmot, Miss I. V. M., 3 Beecroft Road, Brockley.
Wyldes, Miss K., 45 Mellows Road, Wallington.
Armstrong, Miss N. S., Mangerton, Lea Cross.
Collins, H. H., 89 Wellsway, Bath.
Cooke, Mrs. A., Ogbourne St. Andrew School, Wilts.
Davies, T., "Clifton," Gwaun-Cae-Gurwen.
Dean, Miss W. A., 20 St. Albans Road, Harlesden.
114. Laurie, Miss H. N., 35 Pinkie Road, Musselburgh.
Radford, G. L., "Gattons," Westcliff-on-Sea.
Smith, Miss A., "Elmlea," Winchester.
Smith, C. J., Syke Cottages, Stacksteads.
Woollett, H. W., Milton Keynes, Newport Pagnell.
Wrigley, H. B., 36 Dixon Road, Hillsbro'.
Angell, C. B., 6 School Street, Easington Colliery.
Atwell, C., 21 Croft Road, Wallingford.
125. Bennetts, W. N., Oaklea, Ramshill.
Exton, A. J., "Holmleigh," Donington.
Osborne, Miss M. L., 12 Upper Maze Hill, St. Leonards.
Avery, Miss E. M., 1 The Willows, Herstmonceux.
Bell, W. A., School House, Hewish.
Buckley, Miss A. C., 10 Ryhall Road, Stamford.
Franklin, Miss L. A., Trelleck, Monmouth.
Hatswell, H. J., School House, Mottisfont.
Hodges, A., Woodford House School, Birchington.
130. Kirton, H. J., 58 Cranmer Street, Nottingham.
Leeke-Roe, Miss M. C., 13 St. Catherine's Terrace, Guildford.
Mather, J. L., Almorah, Ynysboeth.
Platts, J., Dennington, Framlingham.
Rolfe, Miss A., Grantchester School House, Cambridge.
Roper, J. E., 14 Main Street, Great Bowden.
Brander, S. P., 19 Oldcott Green, Stoke-on-Trent.
Henry, J. G., 52 Livesey Street, Rishton.
Lewis, A. H., North Road, Timsbury.
Marshall, Miss A. M., Friar Street School, West Southwark.
42. Millard, G. E., 104 London Road, King's Lynn.
Reading, W. H., 179 Haxby Road, York.
Robinson, Miss E. L., 2 Cobden Terrace, Hipperholme.
Truran, W. H., Carnkie, Redruth.
Webb, L. R., 108 Dumfries Street, Treherbert.
Wedgewood, T. W., 6 School Street, Easington Colliery.
Bennett, Miss E. C., School House, Little Wittenham.
Billington, A., 28 College Drive, Woodhay.
152. Grainger, Miss A. C., School House, Yockleton.
Lawton, H. H., 20 Walsall Road, Lichfield.
Mason, Mrs. M., 52 Brow Field, Silsden.

Shepherd, W., School House, Blidworth.
Stapleton, Miss E. M., 227 Railton Road, Herne Hill.
152. Webb, Miss H. M., The Elms, Bromham.
Weller, Miss H. O., 4A Lownds Avenue, Bromley.
Yates, Miss L. E., Foxdale, Stourbridge.

Armstrong, R., 15 Fern Avenue, South Moor, West Stanley.
Beamish, Miss E., Holmswood, Ormskirk.
Blackwell, R., Sagars Road, Handforth.
Brambley, S. J. E. S., School House, Exford.
162. Clark, Miss E. J., Holly Grove, Ascot.
Collins, H., The Mount, Wainfelin.
Crouchen, Miss P. K., 11 King's Road, Leiston.
Robinson, Miss M., Rose Cottage, Kirkland.
Sander, H. B. H., Lacy Avenue, Wilmslow.

Bengough, Miss E. M., 42 Beauchamp Road, Forest Gate.
Bullock, P., 71 Yoxall Avenue, Hartshill.
Gollick, Mrs. M., 180 Garden City, Worksop.
Jones, E., School House, Mynyddbach.
171. Jones, W. A., 25 Prescott Street, Hoole.
Mildon, E. H., 26 Thingwall Park, Bristol.
Parkinson, E. M., 4 Woodlea Road, Worthing.
Pickard, Miss M., 53 Clifton Road, Rotherham.

Blight, Miss G., 17 Tyrawley Road, Fulham.
Compton, E., 5 Chapel Street, Oswestry.
Dykes, Miss E. M. I., School House, Hassop.
Foweraker, E. B., 3 Harcourt Hill, Redland.
Guy, J., Parochial School, Mountmellick.
179. Lane, H., 28 Holcombe Street, Derby.
Mead, C. D., 6 York Terrace, Devizes.
Rees, T. E., The Briars, Killay.
Renshaw, Miss L. W., Bircle Vicarage, Bury.
Rose, A. S., "Glenroy," Southampton.
Saunders, J. S. W., Daisy Villas, Staveley Town.
Taylor, H. C. G., School House, Drayton.

Barber, Miss A. M., 4 Wilmington Gardens, Barking.
Chapman, Mrs. E. K., 11 Aldeburgh Place, Woodford.
Dyer, Miss A. G., Bedingfield School, Eye.
Forfitt, Miss A. M., 34 Glenparke Road, Forest Gate.
Furness, J., Farm Training Colony, Wallingford.
Griffiths, L. W., Industrial School, Bonymaen.
Hayward, Miss F. E., Belle Vue Road, Cinderford.
191. Higham, Miss L., Hill View, Mawdesley.
Lovett, Mrs. L., 119 Wakehurst Road, Clapham.
Mortimore, P. T., 36 East Grove Road, St. Leonards, Exeter.
Page, J., Blaisdon School House, Longhope.
Roberts, D., Cantal School, Llanbister Road.
Spink, Miss A. M., Thoresway School, Caistor.
Urry, Miss M. J., White House Farm, Grasby.

Wardman, Miss E., Schoolhouse, Litlington.
191. Weymouth, P. E., 41 Tivoli Road, Margate.
Willott, Miss E. J., 13 Longdin Street, Latchford.
Bellerby, J. R., 11 Scarcroft Hill, York.
Bott, Miss B., Lanercost Hotel, Brampton.
Bothwell, E. B., 37 Selborne Road, Ilford.
Buxton, H., The Poplars, Middle Ings, Hoyland.
Crouch, Miss L. E., University College, Reading.
Davis, P. J., 4 Cranbrook Road, Redland.
Goodall, B., 47 Westleigh Lane, Leigh.
208. Huntley, R. W., The Old Rectory, Ashington.
Jennings, Miss M., Swan Bottom, Great Missenden.
Johnston, Miss E. J., 2 Newstead Road, Liverpool.
Larkin, Miss M. F., School House, Wicken.
Robson, Miss A., 26 Electric Crescent, Philadelphia.
Sparks, A. E., Kensington House, Pensford.
Tiller, Miss I. M., "Heathfield," South Farnbro'.
Birtle, Miss S. R., Moorhead Cottage, Saltaire.
Clapham, J. B., 3 Cobham Road, Norbiton.
Corke, Miss E. F. C., East Compton School, Bristol.
Fisher, H. B., Soke Road, King's Lynn.
222. Gould, Miss A. E., 67 Shrubbery Avenue, Worcester.
Hare, T., School House, Longley-on-Tyne.
Jones, D. E., Green Bank, Ferndale.
Stinson, Miss A. E., 43 Leonard Street, Hull.
Toop, T. G., 32 Lyndhurst Drive, Leyton.
Beaumont, Miss L., Daisy Hill, Shepley.
Budden, Miss L. M., 40 Arlington Road, Surbiton.
Carrick, E. W., Gordon Lane, Ramshaw.
Collis, Miss E. M., School House, Henfield.
Frisby, Miss C. A., Lonsdale House, Deeping.
Goodacre, G. W., Harrow Villa, Melton Mowbray.
Hermon, R., School House, Manley.
Holdstock, Miss E. K., Harrow Road, Worthing.
Hughes, D. M., 4 George's Road, Shiel Park.
231. Jones, J. M., Cwmgwili Council School, Cross Hands.
Jones, W. C., 13 Herbert Street, Aberdare.
Lewis, T., 40 Pleasant Street, Morriston.
Newman, Miss G., 31 Upperton Road, Eastbourne.
Page, Miss W., 48 Locket Road, Wealdstone.
Patrick, Miss E., 10 Harcourt Street, Heworth.
Rees, W. H., Council School, New Tredegar.
Rushby, H., School House, Glentham.
Shaw, Mrs. M., 31 Grove Terrace, Bradford.
Bendall, E. B., Church House, St. Arvans.
249. Branter, W., 184 Parkside Road, West Bowling.
Brown, Mrs. E., Eversley, Ballinger.
Browne, Miss M. A., School House, Abbeycwmhir.

Carter, W., 5 Bridge Street, Usk.
Dixon, T. F., Askham Richard.
Essex, T. P., 73 Bath Road, Walsall.
Goode, Miss W. A., Longley, Island Road, Westbere.
Gould, Miss M. O., 4 Fair View, Oulton Broad.
Lee, Mrs. M. E., Banks Avenue, Pontefract.
Mitchell, Miss R. V., South View, Samares.
Read, Miss C., School House, Castle Ashby.
249. Rees, D. E., School House, Pentre Broughton.
Rice, T., North View, Ilkeston.
Scales, Miss E., 63 Gordon Road, Aldershot.
Spicer, Miss L. M., Brook Road, Stourbridge.
Stevens, H. J., 355 Wellingborough Road, Northampton.
Suckling, C. E., 22 Edburton Avenue, Brighton.
Waters, Miss I., Hooke, Beaminster.
Weaver, Miss M. G., Warden Hill Farm, Leckhampton.
Baker, Miss E. W., Knollsea, Paignton.
Beach, Miss E., Ruspage Cottage, Ruspidge.
Beach, Miss B., Ruspidge, Cinderford.
Cain, E., 63 Castle Hill Road, Ayr.
Deaville, Miss A., School House, Tissington.
Higgins, J., 20 Wilson Terrace, New Silksworth.
Jones, H. C., Clungunford School, Aston-on-Clun.
Mayne, Miss M., Quadring Fen Council School.
269. Miller, F., School House, Castleton.
Mitchell, Miss E. J., 221 Shay Lane, Holmfield.
Reed, A., 6 Vicarage Terrace, Murton.
Souter, R. C., 45 North Terrace, Wallsend.
Taylor, Miss D. E., 20 Effingham Road, Lee.
Thompson, C. S., School House, Helmingham.
Underhill, R. G., 6 Ashfield Terrace, Ryton-on-Tyne.
Wallis, Miss R., Sherwill School, Barnstaple.
Dale, T. G., Aldbury School House, Tring.
Graves, J. B., 172 Lister Avenue, Bradford.
Hanchet, Miss H. E., 44 High Street, Lavenham.
Harrison, R. C., Spence House, Nuttall.
Lawrence, G., School House, Hook.
Little, Miss H., Rose Cottage, Kirkland.
285. Melville, J. S., 3 Shafto Terrace, Stanley.
Shoesmith, L., 152 Park Lane, Little Horton.
Smith, R. J., 68 Marlborough Street, South Shields.
Taylor, Mrs. E., Oak House, Mawdesley.
Troughton, Miss E. J., 52 Romilly Road, Finsbury Park.
Wright, W. C., The Weavers, Binegar.

Class III.

Chapman, Miss E., Plantation House, Iwade.
Davis, J. W., 16 Edna Street, Battersea.
Evans, T. J., Lamb, Hermon.
Gorvett, S., 14 Single Quarters, Raftown.
1. James, Miss L. I., " The Bridges," Laughton.
Morris, A., Brigstock School, Thrapston.
Norrie, Miss C., 3 Balmoral Terrace, Tollcross
Parry, T. P., 17 Park Avenue, Bush Hill Park.
Weaver, C. J. R., Garston House, Mells.
Benson, W., Lynwood, Lawton.
Combes, Miss E. M. M., School House, Graveney.
Davey, L. A., 50 Wembdon Road, Bridgwater.
Davies, D., The Hawthorne, nr. Pontypridd.
Evans, Miss E. F., Wern-y-Court, Bryngwyn.
Gatehouse, Miss A. N., Sollar's Dilwyn, Dilwyn.
Gillespie, Miss C. M., School House, Beddingham.
10. Imber, A. S., The Owls, Kingston Hill.
Johnson, Mrs. A. E., Dunton School House, Biggleswade.
Robinson, Miss A. E., 6 Beverley Terrace, Catchgate.
Spaul, J. R., 27 Oxford Street, Saltburn.
Thomas, B. J., " Brodawel," Tynybonan.
Tusting, Miss J., Bluntisham, Hunts.
Walsh, Miss Teresa, St. Godric's Convent, Durham.
Beeby, Miss N., 102 Palk Road, Wellingboro'.
Bennison, Miss A., " Haulsyke," New Shildon.
Drinkwater, C. H., School House, Pinegoes.
Hawker, H. W., School House, King's Teignton.
24. Howells, J., Maeslan, Tonteg.
Hubbard, Miss M. C., Syleham School, Scole.
Jones, D., Bryndeilo, Nantgaredig.
Knight, A., School House, Wickham.
Amos, C. T. B., " Ferndale," Nuneaton.
Baty, Miss S. J., Jennet's Hill, Bradfield.
Betts, A. E., Slough Fort, Rochester.
Bignell, Miss D. E., Eden Orphanage, Astley Bridge.
Crosby, G. W., School House, Glentworth.
Davies, W. H., The Hollies, Bunny.
Harlow, Miss E. F., 496 City Road, Edgbaston.
32. Heathe, Miss M. E. L., C.E. School, Bramley.
Hemsted, T. S., Front Street, Bedlington.
Hughes, Miss A., 12 Fairview Terrace, Merthyr Tydfil.
Mallows, G. A., 33 Harpenden Road, Manor Park.
Miller, Miss I. A. C., 5 St. Albans Road, Bristol.
O'Niel, E. F., School House, Knugden, Blackburn.
Padgeham, A. J., 8 Stanley Road, Wallington.

Pinnock, H. B., School House, Brockham Green.
Powell, J., Boys' Department, Aberbargoed.
32. Shuker, Miss I. L., School House, Blyborough.
Thompson, Miss A., 57 Argyle Road, Ealing.
Bayley, E. R. A., Mill End, Thaxted.
Berry, Mrs. A., Ranelagh, Chell Green.
Copsey, Miss E. A., Highbrook School House, Ardingly.
Durrant, Miss E. M., Holly Grove, Ascot.
50. Hilldrith, Miss M., Holton-le-Clay, Grimsby.
Kemp, Miss H., 3 Tower Parade, Tankerton.
Lewis, Miss E. F. M., 9 Stoke Park, Coventry.
Storr, Miss S. P., 63 Gordon Road, Aldershot.
Watt, H. H., St. Chad's Avenue, Portsmouth.
Williams, Miss M. P., Aston Villa, Malton.
Barr, R., Hunshelf Bank, Stocksbridge.
Benson, Miss J., 310 Walton Lane, Walton.
Chellew, G., 99 Chevening Road, N.W.
Cooper, Miss M. E., Lyng School, West Bromwich.
60. Croskell, Miss K., 5 Pimlico, Durham.
Houseman, W., Ash Cottage, Glossop.
Morgan, E. J., Cwmsyfiog Council School, New Tredegar.
Rosser, W., Pendre, Abergavenny.
Sheridan, Miss M. M., 14 Rylstone Road, Eastbourne.
Warren, Miss S. E., Fernside, Comer.
Allison, Miss G. E., 11 Queen Anne Avenue, Bromley.
Fox, Miss B. M., 30 Station Road, Barnet.
Holland, Miss L. S., Ivydene, Ickford.
Lawson, Miss G., 54 St. Silas's Road, Blackburn.
Laycock, Miss M. E., 18 Beech Grove, Undercliffe.
70. Morris, J. E., Ivy Grange, Chilcompton.
Poole, T. W., 79 Noel Street, Hyson Green.
Robinson, Ethel, Petfield Farm, Minster.
Schoefield, J., School House, Kirby Malzeard.
Underwood, Miss E. M., 35 Bromboro' Road, Bebington.
Arthur, Brythonfryn, The Bungalow, Bargoed.
Barnes, Miss E. M., Station Road, Helmdon.
Bartlett, F. E., "Dundon," Torquay.
Coles, E. D., 28 Park Crescent, Bristol.
Croft, Miss G., 12 Stafford Street, Hull.
Daws, Miss H, 690 Fishponds Road, Bristol.
80. Edmondson, M., The Bungalow, Whorlton.
Evans, H. T., The Glen, Llantarnam.
Hancock, A., Council School, Bamford.
Harvey, Miss M., School House, Cherington.
Holmes, Miss L., The Mount, Burcot.
Lowrie, Miss I. M., Collingwood, Irchester.
Mercer, Miss M., 3 Coventry Road, Bedworth.
Morgan, Miss E. L., Bridgerule, North Devon.

Redford, Miss E., 22 Craighall Avenue, Levenshulme.
80. Sargent, Miss L., 67 Woolhope Road, Worcester.
Stephenson, S., 3 Albert Terrace, Peases West.
Brooks, Miss E., 13A Malvern Road, Leytonstone.
Chadwick, C., 6 Nursery Terrace, Belfield.
Furness, Miss H., 20 Holborn Street, Woodhouse.
Gray, F. C., Council School, Irchester.
Green, Miss A., 140 Stapleton Road, Bristol.
Knight, T. T., School House, Earlswood, Mon.
Lee, Miss M. A., 17 Lisburne Road, Hampstead.
97. Locke, Miss M. A., Stonesby School House, Leicestershire.
McLearn, J., All Saints School, Marple.
Richards, T. M., 28 Broniestyn Terrace, Aberdare.
Shopland, Miss A., School House, Bredenbury.
Tipper, D., School House, Black Dog.
Webber, Miss G., 12 Demesne Road, Wallington.
Whiting, Miss L. G., 60 Foxhall Road, Ipswich.
Cooke, D. G., 110 Victoria Street, Bristol.
Crossley, Miss S. J., 107 Market Street, Shawforth.
Jenkins, D. R., 267 King Street, Brynmawr.
Martin, Miss J. E., Church Road, Whittington.
Mitchell, Miss P. G., School House, Warninglid.
111. Morgan, L., Penpound, Cymmer.
Passmore, Miss E. M., 14 Holden Road, Wednesbury.
Pullen, Miss R., 7 Monson Road, Harlesden.
Stokes, Miss E. S., 9 Athol Park, Sunderland.
Watson, J. W., 22 Queen's Road, St. George.
Applegarth, W. B., West Blackdene, Durham Co.
Coe, Miss J. M., 72 Queen's Road, Bury St. Edmunds.
Dale, Miss E., The School House, Carburton.
Hill, C., Rosemont, Lincoln.
121. Killeen, Miss J., 453 Stanhope Road, Tyne Dock.
Long, Miss M. M., 65 Argyle Road, West Ealing.
Potter, W. J. H., 77 Devonshire Road, Bristol.
Ryan, J. J., Knockaney N.S., Bruff.
Williams, Miss G. L., Newlyn, Brands Hill.
Dobson, J. C., School House, East Stanley.
Henn, F. L., 18 Pitchford School House, Condover.
Hulme, Miss R., School House, Chaddesley Corbett.
130. Knight, Miss L. B., Fivehead School (C. of E.), Taunton.
Marshall, Miss E. O., Maycroft, Ballafesson.
Stinson, Miss F. M. E., 43 Leonard Street, Hull.
Stubbs, E. L., School House, Orleton.
Foulger, C. B., 12 Beaufort Road, Weston-super-Mare.
Godden, G. H., 78 Dunbar Road, Wood Green.
137. Gosling, S., Claygate, Newark.
Gough, A. J., 21 Alfred Street, Tamworth.
West, J. H., Swansea, South Wales.

Hill, W. H., Marlborough House, Bradford.
Holland, Miss S. K., Northfield College, Birmingham.
Kennett, W. H., Llangibby, Newport, Mon.
Kerry, Miss E. B., School House, Chittering.
137. Kerswill, Miss J., 115 Sefton Park Road, Bristol.
Montgomery, Miss M. H., 30 Trevor Road, Hitchin.
Richards, Miss M., Moreton C.E. School, Newport, Salop.
Stone, C. J., Ivy Cottage, Tettenhall.
Winship, Miss D. E., 75 Belmont Road, Southampton.
151. Aves, Miss A. G., Ashby-de-la-Zouche, Digby.
Dixon, J., 22 Whitehall Road, Gateshead.
Folland, Miss E. M., School House, Bramley.
Guest, W., 26 Waterfall Lane, Old Hill.
Ives, Miss J., 341 East India Dock Road, E.
Lambert, Miss M., 106 Belvedere Road, Burnley.
153. Pearcy, Miss M. G., 5 Bond Street, Halifax.
Pearson, Miss J. W., Sunnyside, Coleorton.
Roast, Miss M. A., Barnston School, Dunmow.
Smith, B., Ammanford, South Wales.
Jenkins, Miss M., 9 Tyrfran, Llanelly.
161. Loftus, F., Wensley School House, Leyburn.
Warren, Miss G., 109 Regent Street, Watford.
Watson, S. A., 18 Shelton Road, Merton Park.
Arthur, J. H., The Bungalow, Bargoed.
Berryman, L., Audley, St. Just.
Gibson, Miss F. A., 5 Harcourt Road, Boscombe.
165. Hansford, Miss M. K. M., Askerswell C.E. School, Dorchester.
Jones, A. G., Park Hurst, Pontymoile.
Molyneux, Miss B. E., 122 Hainton Avenue, Grimsby.
Robinson, Miss M. A., School House, Burnett.
Smith, Miss M. H., Morden Cottage, Oulton Broad.
Clay, Miss L., 11 London Road, Pulborough.
173. Howard, Miss E. G., 94 Ripple Road, Barking.
Turner, Miss E. V., School House, Westmeston.
Burrows, Miss M. E., 175 Walshaw Road, Elton, Bury.
Collings, H., The Cedars, Undy, Magor.
176. Elgar, A. J., 30 Colworth Road, Leytonstone.
Miller, Miss F. A., School House, Moccas.
Neal, Miss M., Hawthorns, Chelwood Gate.
Bevington, Miss D., 82 Nunsfield Road, Fairfield.
Nicholson, Miss H., School House, North Ballachulish.
181. Rushworth, Miss E., 9 Nelson Road, Whitstable.
Stephens, W. T., 21 Tynewydd Street, Pontlottyn.
Stevenson, L., 98 Mitchell Street, Rochdale.
Bullock, Miss F. E., 14 Fitzroy Road, Fishponds, Bristol.
186. Chapman, Miss W. M., Sheedy Camps, Bartlow.
Dyer, E. C., Uphill School, Weston-super-Mare.
Ellis, T. E., 32 Market Street, Rhos, Wrexham.

186. James, T. R., 173 Harold Road, Upton Park.
Kemp, Miss E., 3 Tower Parade, Tankerton.
Owens, Miss M. M., 53 Beaufort Road, Longton.
Senior, B., 32 Preston Street, Earlsheaton.

194. Higgins, J. P., Crumlin, Ballyglunin.
Jones, O. E., Anghorfa, Ystradgynlais.
Metcalfe, Miss H., Big Green, Penley.
Ross, Miss J. A., 45 Station Avenue, Fence Houses.
Todd, Miss E. M., Carbrayne, Newland Park, Hull.
Ware, C., Glancynlais House, Ystradgynlais.

200. Barkley, H. E., 31 Stanley Street, Heaton Park.
Govett, Miss D., 179 Albany Road, Roath.
Jenkins, Miss L., Cartref, Velindre.

203. Batley, Miss F. M. D., Garforth House Cottage, West Garforth.
Brown, Miss S. J., 43 Beach Avenue, Whitley Bay.
Davies, J., 11 Newport Road, Tre Thomas, Bedwas.
Fitz, Miss N. H. B., Braemar, Cranbrook.
Garraway, F. J., 30 Seymour Road, Walcot.
Law, R. R., Sharneyford Council School, Bacup.
Lewis, W., Council School, Rhydcwmerau.

210. Rolfe, Miss M., Shell Cottage, Cheveley.

211. Growthorpe, Miss L. A., Marishes School, Malton.
Lloyd, T., Tyllwyd, Ystrad Mynach.
Perham, Miss L., Glen Road, Fleckney.
Smowton, P. J., 80 Nelson Road, Great Yarmouth.
Thomas, J. R., 34 High Street, Rhos.
Title, Miss L. E., 10 Andee Street, Dublin.

217. Huntley, Miss E. L., Kelmscott Schools, Lechlade.
King, Miss F. M., Manton, Marlboro'.
Molyneux, Miss D., 122 Hainton Avenue, Grimsby.
Peacock, N., 3 Whitby Street, Hartlepool.
Robinson, J., 13 Commercial Street, Thornton.

222. Chaloner, R., 7 Lime Street, Levenshulme.
Christmas, J., 35 Gordon Road, Blackwood.

224. McConachie, Miss M. L., Franklin House, Meadowfield.
Daly, Miss J. M., 54 Grosvenor Square, Rathmines.
Eastland, Miss E. H., 14 Carlton Gardens, Herne Bay.
Green, Miss C. S., Sheffield Road, Erdington.
Norris, W. A., West View, Darlaston.

229. McIntosh, P., 20 Burnell Road, Esh Winning.
Ouzman, Miss F., Holmswood, Gosberton.
Powell, Miss D., 2 Palmerston Terrace, Worthing.
Whitley, Miss S., 557 Rooley Lane, Bradford.

R.H.S. GENERAL EXAMINATION.

March 14, 1917.

Seniors.

Eighty candidates entered for the Society's Senior General Examination held on March 14, 1917. Three of these, however, did not present themselves on the date appointed, and one was not placed.

The Examiners, the Rev. Prof. G. Henslow, M.A., V.M.H., and Mr. James Hudson, V.M.H., report that of the Senior candidates 19, or 24 per cent., were considered worthy of a place in the First Class; 26, or 32 per cent., in the Second Class; and 31, or nearly 40 per cent., in the Third Class.

In Section A (Principles) the first question, on minerals useful to plants, and the fifth and sixth, on the physiology of the cell, were particularly well answered. Some few discussed Mendelism in connexion with varieties appearing naturally; but Mendelism deals with the results of *crossing*, and the question referred to "fixing" without crossing.

In Section B (Horticultural Operations and Practice) some few gave good practical answers to questions nine, eleven, and fourteen, whilst of those who attempted the tenth and the sixteenth there were several excellent replies, which showed a sound knowledge of the principles concerned. This was particularly the case with question sixteen, in which actual experience was evident in the best replies. Taken as a whole the replies showed careful training in the practical work. Indeed, it was a pleasure to read most of them.

Juniors.

Only eighteen candidates entered for the Junior Examination, and of these one secured a Second Class, eleven a Third, and six a Fourth Class.

The replies were not so good as last year, but nevertheless those who entered must not be discouraged in their first attempts. A little more practice will stand them in good stead.

March 31, 1917. W. Wilks, *Secretary R.H.S.*

Seniors.

Class I.

1. Hartley, V. Gaskell, 2 Claremont Terrace, Hextable.
2. Hawkins, L. M., Thatcham Fruit Farm, Newbury.
3. Barbour, Moya, Studley College, Warwick.

Slaney, Margaret O., Studley College, Warwick.
4. Exley, Doris, Thatcham Fruit Farm, Newbury.
Easton, May H., Thatcham Fruit Farm, Newbury.
7. Walrond-Skinner, Judith, Studley College, Warwick.
Green, Alice, 140 Stapleton Road, Bristol.
Athron, D. Lister, 101 Southlands Road, Bromley Common.
Bliss, M. M., Grange-over-Sands.
8. Newman, P. Rutherford, Thatcham Fruit Farm, Newbury.
Horsnaill, C. Ruth, Thatcham Fruit Farm, Newbury.
Peirce, T. A., Green House, Ivybridge, Devon.
Squire, Emily A., Training College, Norwich.
Dow, Elizabeth G., Aldersey Hall School, Handley.
Wheeler, E. S. Cornelius, Aldersey Hall School, Handley.
5. Glover, Hilda K., Studley College, Warwick.
Ainger, Kate L., Thatcham Fruit Farm, Newbury.
Moses, Marjorie H., Elmdene, Berkhamsted.

Class II.

Hughes, Dorothy K., Wolsley Lodge, Feltham.
Cameron, Nancy, 21 Cleveland Square, Hyde Park, W.
1. Snow, Nancy, Studley College, Warwick.
Catchpole, Mildred E., Thatcham Fruit Farm, Newbury.
Owen, Phyllis M., 2 Claremont Terrace, Hextable.
Penrose, Iris C. C., Thatcham Fruit Farm, Newbury.
5. Hardy, Frances E., Deanfields, Londonderry.
Jameson, Ella W., Park Road, Chelmsford.
Edwards, Eveline M. B., Sloperton, Chippenham.
9. Ellis, Beatrice E., Aldersey Hall School, Handley.
Moore, Helen I. S., Woodfield, Malvern Wells.
Dyke, D. E. L., Eastfield, Flax Bourton, nr. Bristol.
2. Mogg, George, 483 Fishponds Road, Bristol.
Langdon, Ethel C., West Lodge, Hastings Road, Bexhill.
Wrigley, Katherine, Studley College, Warwick.
5. Glegg, Nancy, Aldersey Hall School, Handley.
Ozanne, Eileen, Iver, Bucks.
Barns, M. E., Pound Hill, Worth, Sussex.
Dunbar, Rose, 6 Gordon Terrace, Edinburgh.
3. Byars, Jean M., 2 Alfred Place, St. Andrews, N.B.
Lawrence, Nathalie, 33 Greville Road, Maida Vale.
Trench, Ailene A. C., Rathfarnham, co. Dublin.
Mitchell, John S., Newmarket Street, Usk.
Gardner, Elizabeth S., Studley College, Warwick.
4. Dixon, Annette H. O., Studley College, Warwick.
Mitchell, Carrie, 46 Third Avenue, Selby Park, Birmingham.

Class III.

1. Hill, Olive F., Woodlands, Lustleigh, S. Devon.
   Godson, Muriel L., Studley College, Warwick.
   Landan, Mary, Grove End Road, St. John's Wood.
   Grey, Constance M., 16 Meadway Court, Hampstead Garden City.
5. Cran, Agnes V., Backhill House, Carberry, Musselburgh.
6. Taylor, Doris E., 20 Effingham Road, Lee, S.E.
   Binyon, Janet, Clapham, Worthing.
8. Landan, Alice, 28 Grove End Road, St. John's Wood.
9. Prichard, Audrey, Chiltern House, Chesham, Bucks.
   Kitt, Edith, 95 Congreve Road, Eltham.
11. Hannon, Dorothy, 17 West Park, Clifton, Bristol.
   Neal, Muriel, Skeffington, Foxley Lane, Purley.
   St. John Toms, Hilda, Wall Hall, Aldenham.
14. Denniston, Helen, 4 Threadneedle Street, E.C.
   Brookes, Annie H., St. James's Gardens, West Malvern.
16. King, Alfred, 273 York Terrace, Southampton.
17. Gilbert, John, Lednock Bank, Comrie.
   Dickens, Annie M., 106 Corporation Street, Birmingham.
19. Durham, R., Farley Court, Reading.
   O'Reilly, J. P., 114 Park Road, Burslem, Stoke-on-Trent.
   Swinstead, W. L., 45 Heath Hurst Road, Hampstead.
22. Sadler, Daisy B., Hartham Park, Corsham, Wilts.
23. Howes, Dorothy G., Norwich Road, N. Walsham.
   Wilson, B. T., Scroggs Bridge, Staveley.
25. Acworth, F., Amersham, Bucks.
26. Roberts, John, 8 Reedley Terrace, Reedley, Burnley.
   Marshall, Ottoline, 6 Hamilton Road, Harrow.
   Griffiths, W. S., Burry Port, Carmarthen.
29. Ferneyhough, F., 46 Devonshire Road, Bristol.
   Gifford, A. H. B., Iver, Bucks.
   Price, Isobel, Felix Hall, Kelvedon, Essex.

JUNIORS.

Class II.

1. Lamphard, W. H., Downside, Leatherhead.

Class III.

1. Smith, R., Double House, Bower Ashton, Bristol.
2. Bevan, C. W. H., Tredegar Park, Newport.
   Ainger, H. C., 17 Bloomfield Road, Chelmsford.
4. Harris, W. F. E., Lostock, Bolton.
5. Burgess, F., Lostock, Bolton.

6. Taylor, R., Lostock, Bolton.
7. Hoyle, H., Lostock, Bolton.
8 Calcraft, R. H., Lostock, Bolton.
9. { Shillito, F., Lostock, Bolton.
Jones, M., Letheringsett, Holt, Norfolk.
11. Masheter, A., Lostock, Bolton.

Class IV.

1. { Wood, F., 12 Marshfield Road, Goole.
Owens, J. R., Lostock, Bolton.
3. Dugdale, J., Lostock, Bolton.
4. { Cotterill, F., Lostock, Bolton.
Bocking, H., Lostock, Bolton.
6. Brook, R. J. R., Lostock, Bolton.

COMMONPLACE NOTES.

A FINE JUDAS TREE.

IN Vol. XLI., p. 5, of this JOURNAL Mr. IRWIN LYNCH referred to the remarkably fine Judas Tree (*Cercis siliquastrum*) at the Botanic Garden, Cambridge, measuring 27 ft. 6 in. in height. Mr. H. E. LUXMOORE, of Eton, writes that a tree in his garden is even taller though of less circuit of branches. It measures 29 ft. 2 ins. in height, and has freely sown its own seeds on more than one occasion.

CONFERENCE ON ALLOTMENT GARDENING.

A Conference of the Society's Special Horticultural Lecturers from all over the country who are engaged in furthering the Food Production Campaign upon which the Society embarked at the beginning of August 1914, and which it has been carrying on vigorously ever since, was held for a fortnight at Wisley from September 24, 1917. It was under the direction of Mr. F. J. CHITTENDEN, Head of the R.H.S. Laboratory and School of Horticulture, Mr. A. S. GALT, Horticultural Organizer for Yorkshire, and Mr. C. WAKELY, Horticultural Instructor in Essex. As it was the first of its kind, the programme, which we give below, may prove of interest.

PROGRAMME.

Monday, September 24.

2 P.M.– 5.	Introductory Remarks. F. J. Chittenden. The Value of an Allotment. Quarter of an hour addresses by F. J. Chittenden, A. S. Galt, C. Wakely. Brief inspection of the Wisley Garden.

Tuesday, September 25.

9.30 A.M.	The Soil; its Nature and Structure. F. J. Chittenden.
10.30 A.M.–12.30.	Ground Work. C. Wakely.
2 P.M.– 5.	The Laying out of Allotment Plots, Position, Size, etc. Protection. A. S. Galt. Exhibition of Onions.

Wednesday, September 26.

9.30 A.M.	The Soil and the Plant—the Air Supply. F. J. Chittenden.
10.30 A.M.–12.30.	Cultivation. A. S. Galt.
2 P.M.– 5.	Hardy Fruits—Bush Fruits. C. Wakely. Demonstration on Pruning.

Thursday, September 27.

9.30 A.M.	The Soil and the Plant—the Water Supply. F. J. Chittenden.
10.30 A.M.–12.30.	Onions and Leeks for Allotment Gardens. C. Wakely.
2 P.M.– 5.	Potato Cultivation. A. S. Galt. Exhibition of Potatos.

Friday, September 28.

9.30 A.M. The Soil and the Plant—the Nitrogen Supply. F. J. Chittenden.
10.30 A.M.–12.30. Beans for Allotment Gardens. A. S. Galt.
2 P.M.– 5. Cabbages and the Cabbage tribe. C. Wakely.
Exhibition of Potatos continued.

Saturday, September 29.

9.30 A.M. The Soil and the Plant—the Supply of Earth Salts. F. J. Chittenden.
10.30 A.M.–12.30. Parsnips, Carrots, and Beet for Allotment Gardens. A. S. Galt.

Monday, October 1.

9.30 A.M. Seed-Sowing. F. J. Chittenden.
10.30 A.M.–12.30. Other Root Crops for Allotment Gardens. A. S. Galt.
2 P.M.– 5. Hardy Fruits—Plum and Apple. C. Wakely.
Demonstration on Tree Forms.

Tuesday, October 2.

9.30 A.M. Spacing. F. J. Chittenden.
10.30 A.M.–12.30. Salads for Allotment Gardens. C. Wakely.
2 P.M.– 5. Arrangement of Crops on Allotments. A. S. Galt.
Exhibition of Apples.

Wednesday, October 3.

9.30 A.M. Food Values. F. J. Chittenden.
10.30 A.M.–12.30. Disposal of Allotment Garden Produce. A. S. Galt.
Co-operation among Allotment Holders. C. Wakely.
2 P.M.– 5. Successional and Intercropping in South. C. Wakely.
Successional and Intercropping in North. A. S. Galt.
Demonstration on Transplanting.

Thursday, October 4.

9.30 A.M. Spraying. F. J. Chittenden.
10.30 A.M.–12.30. Storing and Winter Keeping of Vegetables. C. Wakely.
2 P.M.–5. The Potato Disease and the Results of Spraying. A. S. Galt.
Making of Burgundy Mixture.
Exhibition of Spraying Instruments.

Friday, October 5.

9.30 A.M. Mistakes Lecturers make. F. J. Chittenden.
0.30 A.M.–12.30. Soil Pests. A. S. Galt.
2 P.M.– 5. Seed Economy and Seed Saving at Home. F. J. Chittenden.
Exhibition of Beets.

POTATOS ON BRACKEN LAND.

The war has led to the making of many experiments, and not the least interesting are those connected with the treatment of the land. Mr. JOHN A. A. WILLIAMS, of Aberglaslyn Hall, Beddgelert, N. Wales, tells us of a particularly interesting one made by him on bracken-infested land there. The land was broken up and the ashes of burnt bracken, together with a little basic slag, were strewn upon the ground as manure—nothing else. Potatos were then planted and grown on in the usual way, giving an excellent crop. Such land in Ireland, too, when broken often produces good results with potatos. Bracken ashes, it may be noted, so long as they have not been exposed to the weather, contain a fair amount of potash.

COMMONPLACE NOTES.

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BOOK REVIEWS.

"The Principles of Plant-Teratology." By W. C. Worsdell. Vol. II. 8vo. 53 plates, 296 + xvi pp. (Ray Society, London, 1916.) 25*s*. net.

The features that characterized the first volume of this important work are characteristic also of this, the final one, dealing with the teratology and origin of the flower and fruit. The various stages by which the most highly developed flowers of the present day have reached their special form are discussed in the light thrown upon the subject by the malformations which so frequently occur and which, naturally, attract the attention of the curious. Two types of inquirer will find much to interest them in the present section of the work—those whose interest lies mainly in noting aberrations in floral structure, such as doubling, proliferation, and the like, and those who look to such changes to aid in explaining the origin of the parts of the flower from primitive forms. The latter especially will find the discussions of the various views that have been expressed from time to time, with the bibliographies which form a feature of the book, of great value, and both will find interest in the clear plates some of them well coloured) for which all the publications of the Ray Society are remarkable.

"Plants, Seeds, and Currents in the West Indies and Azores: The Results of Investigations carried out in those Regions between 1906 and 1914." By H. B. Guppy, M.B., F.R.S.E. (with three maps, and frontispiece of West Indian Drift Seeds and Fruits brought to the shores of Europe.) 8vo. 531 pp. (Williams and Norgate, London, 1917.) 25*s*. net.

This great work consists of 440 pp. of text, 50 pp. of appendix, and a general index of 27 pp. Of the nineteen chapters, i. and ii. deal with West Indian Currents; iii. and iv. Atlantic Currents; v. The Mangroves in Jamaica; vi. and vii., xi. and xii. The Drifts of the Turks Islands, near the Bahamas; viii.-x. Miscellaneous Plants; xiii. Currents of the Southern Hemisphere; xiv. Differentiation in Plants; xv. Their Distribution; xvi. The Distribution of *Carex* and *Sphagnum*; xvii.-xix. The Azores.

The first four chapters dealing with currents require the first eighty-three pages and contain a large mass of data, as to the means of mapping the surface or drift currents. Two methods are fully described: the natural discharge by rivers of seeds and fruits into the oceans, and experiments with bottles thrown overboard at certain places and then recovered elsewhere.

The final result is excellently displayed on a map.

The great main currents run in the tropics from east to west, eing due to the rotation of the globe from west to east. Wherever here is an "open" space, the current rotates. Counter-currents and rifts occur in many places, according to the configuration of the ind. An important one runs from west to east, all round the south f Australia, South America, and South Africa.

Each chapter concludes with a useful summary; chapters xiv. and v. deal with "Differentiation" [Evolution] and Distribution of 'lants. The author assumes the former existence of "primitive, orld-ranging generalized types," the differentiation of which was "in esponse to the differentiations of their conditions." "Natural amilies seem to fall into two groups, the primitive and the derivative." But the author does not explain why some are primitive, nor what this ord implies, especially as he includes the Compositae, which many otanists regard as the *last* family to have been evolved. He does ot refer *to the structure of flowers*, upon which evolution so largely lepends, but to the *wide distribution*. Again, he seems to think that the nsectivorous families, Sarraceniaceae, Nepenthaceae, and Droseraceae re, on that account, allied; whereas, according to Bentham and Hooker, they are situated widely apart, the similar structures having ike causes only.

In dealing with longitudinal distribution the author follows Gray nd Dyer, considering that the Arctic regions supplied many plants which descended along certain longitudes, so that certain Japanese plants are allied to plants on the east side of North America; such as he Ampelopsis species, and that other plants spread down the three ontinents to the south temperate zone. But there are many links etween Australasia, the Cape, and South America, and it is more robable that the former Antarctic continent supplied a common ource for certain species of *Pelargonium, Adansonia*, &c., for the ea-soundings reveal ridges extending to the three continents at depth of 2,000 fathoms, while the sea is 3,000 fathoms between the ontinents.

"The Carnation Year Book." Edited by J. S. Brunton. 8vo. pp. (Hortus Printing Co., Burnley, 1917.) 1s. 6*d.*

It is inevitable that the Year Book of any Society should contain considerable amount of material of more or less ephemeral interest, ich, for example, as lists of prize-winners; but, as has been done here, ore permanent value may be given to such lists by noting the compo- tion of prize-winning groups and so on. In addition to these lists, d information relating to the Society, articles by its members add the interest of this little book, which is the organ of the Perpetual lowering Carnation Society, and particularly valuable is the list Carnations registered by the Society with the raisers' names.

"Name this Flower." By G. Bonnier. Translated by G. S. Boulger. 8vo. xii + 331 pp. (Dent, London, 1917.) 6*s*. net.

This simple handbook will be welcomed by many who desire an easy way to knowing the name of the common wayside flowers, for it is easy to use, and reliable. We have tested it for a number of flowers of different groups and found it always to lead to the name with a minimum of trouble and (if the simple directions are followed) with certainty. The learned author has, of course, dealt with the common plants of France, but the translator has added a few, so that the common plants of Great Britain are all here. Does one find a plant with a white flower and a rosette of red, stalked, round, hairy, sticky leaves? Turn to page 2 and we are asked (1) to decide whether it is a plant which bears flowers or not and directed to (2). Is it herbaceous or not? Are the flowers arranged in close heads or not? Are the flowers red, white, etc.? (to No. 506). Are they arranged in an umbel (illustrated) or not? (507). Is the flower regular or not? (508). The shape of the leaves? Their arrangement? and so on, until at last we are led inevitably to the Common Sundew, which is briefly described and neatly figured. Coloured figures are given of several plants and an annotated Index of English plants with their uses, etc., which add very much to the value and interest of the book.

"Manual of Fruit Diseases." By L. R. Hesler and H. H. Whetzel. xx + 462 pp. 8vo. (Macmillan, New York, 1917.) 8*s*. 6*d*. net.

The authors candidly state what every plant pathologist feels, that "the best possible book on fruit diseases cannot entirely meet the situation," that is, the needs of "every fruit-grower regarding his many problems." Nothing can take the place of personal inspection and the specific advice of a competent pathologist furnished with full information upon all the facts of the case. A good book used with discretion is the next best thing, and this the authors have produced for the American public. That all the facts, or their relative importance, will be the same on this side of the Atlantic as on that is unlikely, but that they will be suggestive to the fruit-grower is certain. The fruits dealt with are apple, apricot, blackberry, cherry, cranberry, currant, gooseberry, grape, peach, pear, plum, quince, raspberry, and strawberry. The account of the several diseases of each of these fruits is followed by a chapter on fungicides, and an appendix on books and meanings of terms. Perhaps the most troublesome disease of the apple in England is that known as scab, caused by the fungus *Fusicladium dendriticum*, and to be controlled here by the careful pruning out of dead and dying spurs and branches, and by two sprayings with Bordeaux mixture (or in the case of tender-leaved apples, such as Cox's Orange, with lime-sulphur), one before the buds burst, the other just after the petals fall. The form on the apple twigs appears to be rare in America, and the recommendations as to pruning are thus omitted from the account given by the authors, dependence being

placed upon the collection of fallen leaves and spraying with lime-sulphur, the concentrated solution (testing 32° Baumé) being diluted with forty times its bulk of water. Similar small differences will be found with other diseases, but comparisons with European conditions are often made, and this adds to the value of this book to English readers. One of the authors spent a considerable time in Europe and made himself familiar with the diseases of plants here, and he has used the knowledge thus gained to great advantage.

The authors deal not only with the diseases due to fungi and bacteria, but also with such things as "glassiness," "bitter-pit," 'Jonathan spot" of apples, all of which are too familiar in this country, and none of which, alas, have so far been completely and thoroughly investigated. The illustrations are excellent, and we have nothing but praise for this work from beginning to end.

"British Insects and how to know them." By Harold Bastin. 'o. ix + 129 pp. (Methuen, London, 1917.)

There is no better brief review of British Insects than this useful tle volume. The plan of it is to describe the general structure of sects, and the marks that distinguish them from their nearest lies; then to take each large group of insects, as the butterflies id moths; the curious little wingless insects most simple of their nd and possibly most primitive; the beetles; and so on; devoting a iapter to each. The principal characteristics of each group are mensoned and the main variations within the group, with a short account : the common members of it which are more likely to be met with by ren the casual inquirer into the living creatures of the countryside. :veral plates help to give an idea of the insects dealt with, and increase ie usefulness and value of the book greatly.

"The Wild Foods of Great Britain; Where to find them and ow to cook them." By L. C. R. Cameron. 8vo. xiii + 128 pp. Routledge, London, 1917.) Paper covers, 1*s.* 6*d.* net.

The organic kingdom in almost all its branches is drawn upon provide material for this little book, and even the caterpillars the cabbage butterflies are said to be "a real delicacy" if "lightly ooked in boiling butter, and sprinkled with pepper and salt." We ar the materials required for making many of the dishes, such as ..., palatable, will be beyond the means of the very poor, for whom ie book is intended. For those, however, whose means permit, and ho have a *penchant* for trying new dishes, this little book will prove complete guide. The author is careful to point out the necessity or condiments and gives a long list; and, moreover, he is also careful o say that the cooking of these wild and war-time rations calls for ot a little trouble—trouble perhaps rarely expended upon the ooking of ordinary foods in ordinary homes.

"The Cultivation of Allotments." By P. Elford and S. Heaton. 8vo. 62 pp. (Clarendon Press, Oxford, 1917.) Paper covers, 8*d.* net.

Not a little good has been done by the publication of booklets on Allotment Gardening during the present year, and especially valuable have they been when they have been intended for certain definite districts and have dealt with crops which have been found to "do well" in those districts. The present is one of this type, and very good it is. The only fault we have to find with it is that it makes no attempt to show which crops are the most valuable as foods; which, that is, give the greatest return for the amount of soil occupied by them, and for the cost of seed and cultivation—no, not quite the only fault, for we cannot but regard the practice of burning turf as a very wasteful one, not to be recommended even in the case of heavy soil. If it is too rough and full of perennial weeds to turn in, then it is better to stack it for future use. The weeds will die if stacked closely and rot down to a useful manure. Apart from these little criticisms, we have nothing but praise for this most useful little book.

"Food Gardening for Beginners and Experts." By H. V. Davis, B.Sc. 8vo. 44 pp. (Bell, London, 1917.) 6*d.* net.

"Vegetable-Growing in War-Time." By H. Cowley. 8vo. 30 pp. (Country Life, London, 1917.) 6*d.* net.

These are two further useful little handbooks on vegetable-growing, giving both general and detailed information on the management of kitchen-garden crops. Neither of them makes enough of the sowing of such things as beet, carrot, and other crops in July, although successional cropping is dealt with in both. In the former book too much is promised in some cases. Rarely indeed can peas sown on March 3 be harvested on June 2, and cleared away on that date to be followed by dwarf beans, which in their turn are disposed of by September and their place taken by swedes or turnips. September is, in most places, too late to sow swedes, and first-early peas, even in our own warm soil in a warm district, sown in the open in the middle of January never give us a first picking before June 5 or 7 and are not ready to clear away until the third week in the month. Strangely enough, too, neither mentions the sowing of onions in August for transplanting next year: that best of all methods for circumventing the onion-fly. And on the question of onion-growing there is a diametrical difference of direction: the one book tells us to keep the hoe going; the other instructs us on no account to use the hoe! We are inclined to think sugar-beet will not find a permanent place as a garden crop as a substitute for sugar or for use as a vegetable, but for those who incline to try it a long paragraph in the former book gives directions. It is not to be dug up till October, and by that time most of the fruit used for jam-making in the household will have passed its prime, unless it has been "pulped"—a process little understood in most households, though common enough in the jam-factory.

"British Wild Flowers: Their Haunts and Associations." By W. Graveson. 8vo. 320 pp. With fifty plates, illustrating over one hundred species. (Headley, London, 1917.) 7*s.* 6*d.* net.

This work consists of twenty-eight chapters, referring to wild flowers in different months, as well as in clover fields, chalk hills, sea cliffs, woods, riverside, moor and mountain, salt marshes and dunes.

There is a monthly Floral Calendar (31 pp.), Index to Flowers (8 pp.).

This book is *not* "intended for the study of botany," but as an agreeable companion for the dilettante. Numerous interesting facts about many wild flowers are culled from some seventy writers, among whom Gerard and Shakespeare stand foremost.

The illustrations, coloured and plain, are valuable additions to the volume.

"The Early Naturalists: Their Lives and Work" (1530–1789). By L. C. Miall, D.Sc., F.R.S. 8vo. 396 pp. (Macmillan, London, 1912.) 10*s.* net.

This is a valuable work. It is divided into nine sections, headed as follows: (I.) The New Biology, "The Revival of Botany, from Brunfels to Rondelet" (to 1566). (II.) The Natural History of Distant Lands (to end of sixteenth century). (III.) Early English Naturalists and O. de Serres (1619). (IV.) Ray, Willughby, and Lister (1712). (V.) The Minute Anatomists, Hooke, Malpighi, Grew, Swammerdam, and Leeuwenhoek (1723). (VI.) Early Studies in Comparative Anatomy; Redi, Perrault, and French and English Contemporaries (1708). (VII.) The School of Réaumur (1892). (VIII.) Linnaeus and the Jussieus (1778). (IX.) Buffon (1789, and later). Index.

Dr. Miall is so well known as an accurate scientist that we need only say that all the sections are equally and thoroughly well done, concisely but efficiently.

"Field Crops for the Cotton Belt." By James Oscar Morgan, M.S.A., Ph.D., Professor of Agronomy in the Agricultural and Mechanical College of Texas. 8vo. xxvi + 456 pp. With 75 illustrations in the text. (Macmillan, New York, 1917.) 7*s.* 6*d.* net.

This addition to the "Rural Science Text-books" is on the same lines as the previous volumes of this valuable series, and as its title implies it treats of field-crops suitable for cultivation within the area where cotton is the principal crop. About one-third of the total number of pages is devoted to cotton, the other crops dealt with being maize or Indian corn, oats, wheat, rye, rice, sorghums (millets), sugar-cane, and pea-nuts, or ground-nuts as they are called in this country. Although the climatic conditions that prevail in the cotton belt of the United States of America are different from those in this country, there is much that the British farmer and agricultural student could earn regarding certain of the crops mentioned, for the author quite

correctly points out that the student who is unfamiliar with the crop and its life-processes is ill-prepared for a proper study of the tillage practices involved in the production of the crop. For this reason special attention has been given to plant structure and nutrition, and numerous chemical analyses of the crops are quoted, together with formulas for suitable fertilizers. Probably the book will appeal more to the farmers and students in the Colonies than to readers in this country, and to such it can be strongly recommended.

"Manual of Gardening in New Zealand." By David Tannock F.R.H.S., Supt. of Gardens and Reserves, Dunedin, and others 8vo. 298 pp., illustrated. (Whitcombe and Tombs, London and Christchurch, N.Z., 1917.) 5s.

This manual has been prepared to supply a demand for a book specially devoted to gardening in New Zealand, where, owing to different conditions, English books are not altogether suitable, especially as regards the varieties of plants recommended for cultivation.

As an instance of the variety of climatic conditions prevailing in New Zealand, it is mentioned that sub-tropical Auckland in the north has a mean maximum temperature of 63·9° F. and a mean minimum temperature of 51·6° F., whilst Invercargill in the south has a mean maximum of 58° F. and a mean minimum of 41° F. It thus follows that in the north Hippeastrums, for example, can be grown as hardy bulbs in the open border, whilst in the south they require a greenhouse.

The manual treats of all branches of gardening, and there are chapters by specialists on hardy bulbs and garden foes, on vegetable and fruit growing, and on rose growing for exhibition. One of the most interesting chapters to the English reader is that relating to the native plants of New Zealand, which the author points out have hitherto been neglected by New Zealand gardeners. It is interesting to learn in this connexion that since the red manuka (*Leptospermum Nichollii*) received the gold medal as being the most meritorious new plant at the International Horticultural Exhibition held at Chelsea a few years ago, the native plants of New Zealand are becoming prominent features in all the public gardens of the country. It is to be hoped that this recognition will result in the more extended cultivation of these plants by private persons; they are numerous in species and varied in their character, comprising trees, shrubs, alpines, and ferns, sufficient in themselves to stock a goodly sized garden. Most of them are greenhouse subjects in this country, although the Olearias and shrubby Veronicas, to mention but two families, are valued hardy shrubs.

The manual concludes with a calendar of garden work and a full index to the names of the plants mentioned. It is well printed in a generous type on good paper; the illustrations have been supplied chiefly by nurserymen and seedsmen in this country, and one could have wished that more photographs of New Zealand gardens had been included, and that those which are included had been named.

"Theophrastus: Enquiry into Plants." By Sir Arthur Hort. 2 vols. 8vo. (William Heinemann, London, 1916.) 10s.

This is the first English translation of the oldest work extant on plants in general, Hippocrates' having written of them solely with regard to their medicinal values. This led Linnaeus to style Theophrastus the Father of Botany. He is supposed to have embodied in this book the teaching of his master Aristotle, from whom also he inherited the botanic garden formed by him in Athens.

The great importance of the work as the foundation of botanical science has been ably dealt with by Greene in " Landmarks of Botanical History," chap. ii., in the recapitulation of which he enumerates seventeen elemental truths of universal botany, recognized and clearly enunciated by Theophrastus.

It is astonishing how much he knew of the functions and structures of plants, considering that he had no aids to his natural vision for discovering them.

It is perhaps more as the owner and student of the first botanical garden, the keen observer of living plants, and the historian of the horticultural methods of his age that his book should be studied by modern garden lovers.

They will learn much, be reminded of numerous facts, and delighted with many a pleasing proof that the great Greek did not believe all he was told. Of this last class may be instanced the dignified way in which he terms irrelevant or absurd the superstitious practices enjoined to be observed when gathering certain herbs; such as dancing round the mandrake, repeating as much as possible about the mysteries of love.

Think of a Greek born in the fourth century B.C. knowing that "Slips for planting should be taken if possible with roots attached, or failing that, from the lower rather than from the higher part of the tree, except in the case of the Vine." Again for transplanting, "The holes should be dug as long as possible beforehand, and should always be deeper than the original holes, even for those whose roots do not run very deep." That the Almond, though it buds early, sheds its leaves late, while the Mulberry buds late and falls early. Leaves are smoother on the upper surface, having fibres and veins below, as the human hand has its lines. Asparagus has no leaves. The leaflets of the Ash were to be regarded as forming but one leaf, because all are shed at once.

He often writes "Some however say," followed by some quaint idea; such as that vine and pomegranate cuttings should be set upside down. But on his own authority he says the fig progresses more quickly and is less eaten by grubs if the cutting is set in a squill bulb. Root pruning is advised for trees that do not bear fruit but run to a leafy growth, and he knew of the separation of the sexes in the palm and fig.

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by him and still in common use. Many of them actually applied to the same plants—Anchusa, Anemone, Althaea, Antirrhinum, Arum, Asparagus, Adiantum, Daphne, Donax, Helix, Helleborus, Euonymus, Leucoium, Calamus, Cedrus, Cydonia, Crocus, Conium—to travel a little way down the alphabet.

Sir William Thiselton-Dyer undertook the identification of the plants, and there is an excellent and most interesting Index of such as can be determined.

The author has endeavoured to give us the ideas of Theophrastus in readable plain English, and to make it as nearly as possible a literal translation of the original. He has succeeded so well that while there is no difficulty in grasping the meaning, the spirit and charm of a Greek construction lingers in most of the sentences.

It is not perhaps a book to read straight through from cover to cover, but for all who care to know more about their plants than their monetary value and their exact shade of colour in a mass, there is a mine of pleasure ready to hand, and easily obtained by following up the references to one's favourites as given in the Index.

"Plants Poisonous to Live Stock." By H. C. Long, B.Sc. vii + 119 pp. 8vo. (University Press, Cambridge, 1917.) 6*s.* net.

Mr. Long has compiled from various sources a very interesting and valuable account of the wild plants and plants commonly cultivated in this country which are poisonous, or are suspected of being poisonous to man and animals. Many difficulties lie in the way of proof of poisonous properties, and even when this is forthcoming the isolation and identification of the poisonous principle is difficult, and has often not yet been accomplished with certainty. The present book must be regarded as a summary of what can be gathered from books, of which a long list is given at the end of the book.

Not a few of the commonest plants are at times or in some circumstances liable to cause trouble, the potato not being exempt, but not all are noted by the author. The roots, for instance, of the scarlet runner have been known to cause severe illness and probably death to horses which have eaten them; and, as the author frequently goes beyond the title of his book and includes plants poisonous to mankind, he might also have included the leaves of rhubarb, which, as is well known, often cause illness when eaten, even after cooking. He might also, since he mentions the irritation caused by handling Narcissi to the workers in the flower-fields, have made some reference to the very long list of plants, native or cultivated, in this country which cause more or less severe skin irritation or eruptions.

The book is very useful, but might thus have been made more complete. Tobacco, even, is omitted.

The general arrangement of the plants follows the order of Bentham and Hooker's Genera Plantarum; but it is strange to see the Castor-oil plant included among the Leguminosae.

As usual with the books published by the Cambridge University Press, the "get-up" of the book is excellent.

" Standard Cyclopedia of Horticulture." By L. H. Bailey. Vol. vi. -Z and Supplement. 8vo. v + 3043-3639 pp. (Macmillan, New ork, 1917.) 25*s.* net.

This great work is brought to a conclusion by this sixth volume ealing with genera of garden plants the names of which begin with ne or other of the last eight letters of the alphabet, together with rticles on such subjects as seeds and seed-growing, storage of plants, ransportation, soils, and the like.

The supplement contains some interesting statistics, from which appears that the Editor had over four hundred collaborators, and 2,493 species belonging to 3,214 genera, besides subsidiary notes nd lists including 6,049 other species, and 12,458 synonyms are ealt with—truly a stupendous list!—and that the plants are dealt ith well notices of the earlier volumes will have made evident.

The Supplement also contains a long list of names in common se among nurserymen and others for reference, together with discussion on horticultural nomenclature. Finally an index to ynonyms, vernacular names, and miscellaneous references which re not in alphabetical order in the Cyclopedia, brings the work to n end.

Only a man of great energy could have brought such a work s this to a successful conclusion, and when energy is united with nowledge, as it is in Prof. L. H. Bailey, and when also, as with him, o these is added the power of the teacher to put his points clearly nd forcibly, and when also he is able to secure the collaboration f the ablest exponents of horticulture in America, a book of the reatest possible value may be expected, and those who go to it ith the expectation of finding such a work will, we are sure, not e disappointed.

(1) "The Beginner's Gardening Book." (2) "The Allotment." 3) "Early Vegetables." (4) "Potatoes and Root Crops." (5) The Garden Frame." (6) "Tomatoes and Salads." (7) "Pro-table Small Fruits." By H. H. Thomas. (Cassell, London, 1917.) aper covers, 7*d.* net.

These books form a series under the general title "Gardening andbooks for Amateurs." They are on the whole very useful, ell illustrated little books in attractive covers, but there are, aturally, many gaps which one would like to see filled, and a few ings with which one cannot agree. The first deals with the whole outdoor gardening, is necessarily very brief, and is not always quite ear to the beginner, and we regret to see no reference to bastard enching, usually the best treatment for newly broken land which is desired speedily to bring into good heart. It is, however, described "The Allotment." In the latter a very good plan of cropping is ven on p. 21, but, strangely enough, nothing is said there about beans, ough they are very profitable and better in every way than peas for lotment gardens. "Early Vegetables" and "The Garden Frame"

bear a considerable resemblance to one another, as is to be expected, and a useful addition to both would have been an account of a method of making a hotbed without the aid of farmyard manure. Sprouting Potatos is recommended but clear directions are not given. Tripoli Onions are recommended, for autumn sowing, and very good bulbs are produced, but they will not keep. 'Bedfordshire Champion,' 'Giant Zittau,' 'Autumn Triumph' are all good for the purpose and far better keepers. "Tomatoes and Salads" is very useful, for it brings the growing of salads prominently before the beginner, who too seldom pays much attention to this branch of food production —a subsidiary but certainly an important one. "Small Fruits" is, again, a useful little book, but a warning against digging among raspberries would be an advantage.

"Allotments and Small Holdings in Oxfordshire." By A. W. Ashby. 8vo. viii + 198 pp. (Clarendon Press, Oxford, 1917.) 5s. net.

The publication of this "Survey made on behalf of the Institute for Research in Agricultural Economics, University of Oxford," at the present time is particularly opportune. The minds of many are occupied by the necessity for making more of the land than is at present made, and large numbers of those who consider the matter look towards the more intensive cultivation of the land to attain this end, with at least as much assurance as the more extensive. Furthermore, of the many schemes, existent and embryonic, for enabling those broken in the war to lead an independent life none is perhaps more attractive than land settlement.

The Survey is divided into two parts, the first dealing with allotments, the second with small-holdings. In each the genesis of the movements which led to their establishment is sketched, and the course of their development traced. The various Acts of Parliament governing them are clearly reviewed and the present state of the law on the matter lucidly explained.

The discussion of the condition of the allotments and small-holdings necessarily involves a far wider statement than would embrace the allotments and holdings of Oxfordshire alone, for the principles on which successful treatment of such holdings depends had to be sought and stated, and it is here, and in the commentary the facts given make upon them, that the peculiar value of the book lies.

The main difficulties in the way of success (apart from ignorance of cultivation) appear to be three: lack of capital, unwillingness to co-operate, or perhaps a suspicion of co-operation, and a tendency towards forming colonies of small-holdings remote from markets. Accessible markets are a *sine qua non* for successful small holdings, especially when failure to co-operate in placing goods on the market leads to waste of labour, time, and money in marketing. This same lack of co-operation increases the cost of working a holding, for expensive and little-used, but necessary, tools and labour-saving devices

are not communal possessions, but each holding must be self-contained. In other ways a small-holding is more expensive to work than a large one, and too often the small-holder is hampered at the outset by shortage of money or burdened by mortgages and the like.

Probably no one scheme would meet all cases, nor would rural credit banks solve the whole problem. Indeed, in all probability, until a community arises accustomed to conditions of life on small-holdings, able and willing to shake themselves free from fads and the anti-this-that-and-the-other-isms which seem to mark so many small-holding communities, and willing, too, to work as a community with a common aim and individual freedom to act in everything, except to the detriment of his neighbours, the small-holder will have a constant struggle, and it will take at least a generation to see this. One thing seems clear, that the future of the small-holding lies, not in making the holding a miniature farm, but in cultivating it with a special aim as a market or fruit garden, or in some other particular direction.

"The Herbaceous Garden." By Mrs. Philip Martineau. Ed. III. 8vo. xx + 298 pp. (Williams & Norgate, London, 1917.) 7*s.* 6*d.* net.

We are glad to see this very useful book has gone to a third impression so quickly. It has not been added to since the publication of the edition which we reviewed in 1914, but some necessary revisions have been made.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

THE Editor desires to express his grateful thanks to all who have so willingly assisted in making abstracts. He would be glad if any who have time and who are willing to help in any special direction in making the abstracts more complete would communicate with him.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP IN THIS WORK.

Archer, F. G., F.R.H.S.
Baker, F. J., A.R.C.Sc., F.R.H.S.
Ballard, E., F.R.H.S.
Bowles, E. A., M.A., F.L.S., F.E.S., F.R.H.S.
Brennan, A., B.Sc., F.R.H.S.
Bunyard, E. A., F.L.S., F.R.H.S.
Cavers, Prof. F., D.Sc., F.R.H.S.
Cayley, D. M., F.R.H.S.
Chittenden, F. J., F.L.S., F.R.H.S., V.M.H.
Clayton, C. P., F.R.H.S.
Darlington, H. R., F.R.H.S.
Dykes, W. R., M.A., F.R.H.S.
Ellis, E. T., F.R.H.S.
Farmer, Professor J. B., M.A., D.Sc., F.R.S., F.R.H.S.
Gough, G. C., B.Sc., A.R.C.Sc., F.R.H.S.
Groom, Professor Percy, M.A., D.Sc., F.L.S., F.R.H.S.
Hennesey, J. E. W. E., B.A., B.Sc.
Henslow, Rev. Professor Geo., M.A., F.L.S., F.R.H.S., V.M.H.
Hodgson, M. L., F.R.H.S.

Hooper, Cecil H., M.R.A.C., F.R.H.S.
Jeffery, Violet G., F.R.H.S.
Kerridge, Rev. A. A., M.A., F.R.H.S.
Lake, G. D., F.R.H.S.
Ludford, R. J., F.R.H.S.
Newstead, Professor R., A.L.S., F.E.S., F.R.S., F.R.H.S.
Pethybridge, G. H., B.Sc., Ph.D., F.R.H.S.
Petts, Alger, F.R.H.S.
Ramsbottom, J. K.
Rendle, A. B., M.A., D.Sc., F.L.S., F.R.S., F.R.H.S., V.M.H.
Reuthe, G., F.R.H.S.
Ross, R. C. S., F.R.H.S.
Scott Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
Simmonds, A., F.R.H.S.
Smith, William G., B.Sc., Ph.D., F.R.H.S.
Veitch, Sir Harry J., F.L.S., F.Z.S., F.R.H.S.
Webster, A. D., F.R.H.S.
Whittles, W., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS.

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Applied Biology	Ann. Appl. Biol.
Annals of Botany	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton	Ann. Rep. Agr. Res. Stn., Long Ashton.
Beiheft zum Botanischen Centralblatt.	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticultura	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research	Jour. Agr. Res.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal of the Society of Chemical Industry	Jour. Soc. Chem. Ind.

Journals, &c.	Abbreviated title.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.
† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Absorption in its Relation to Soils, The Phenomena of. A Résumé of the Subject. By J. A. Prescott (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—Included among absorption phenomena are the removal by soil of salts and colouring matter from solution; the deodorizing of liquid manure by sand; the replacement of NH_3 by Ca and Mg when a solution of sulphate of ammonia is shaken up with soil; the absorption of phosphate and bases by precipitated hydroxides of iron and of aluminium; the precipitation of a solution of humus in ammonia by salts of copper, lead, magnesium, and calcium; the absorption of potassium from its salts by a sphagnum moor soil with substitution of calcium and magnesium; the absorption by such a soil of water from a decinormal solution of potassic chloride, the concentration of the latter being therefore increased (negative absorption). The work of Way, Warington, Liebig, Graham, Kōnig, Ramann, van Bemmelin and others is reviewed, and a clear account of the most recent work on sols and gels is given. The conclusion drawn by the author is that there is a tendency to reject entirely the chemical explanation of Way and to associate all soil absorptions with the general phenomena of adsorption. A very interesting and helpful summary of the present state of knowledge of the subject.
J. E. W. E. H.

Alaska, Agricultural Experiment Stations, Report of 1914. By C. C. Georgeson (*U.S.A. Exp. Stn., Alaska,* July 22, 1915; figs.).—The grower in Alaska is very much at the mercy of the seasons. The climate is severe and unsuitable to many crops, and in interior Alaska it seems impossible to predict what the weather conditions will be. No two corresponding seasons seem ever to be alike within any reasonable period of years. All over the State the growing season is short at its best, and when it is still further shortened by early autumn frosts or much cloudy and wet weather during the ripening period the results are sure to be unsatisfactory.

Experiments have repeatedly proved that hardiness and earliness cannot be bred into cultivated crops by mere selection, at least during the average active life of a man. With some exceptions all the varieties of fruit trees and bushes imported from the States have proved unsuitable to Alaskan conditions. Alaska experiment stations are therefore called upon to create, by hybridization, acclimatized strains of all the economic plants. This bulletin gives an account of the experimental breeding work of the various stations, much of it showing most satisfactory results. Strawberries, currants, raspberries, gooseberries, and blueberries have been found to do well; cranberries not so well. Apple-growing is still in the experimental stage, cherries and plums have so far not proved a success. Potatos, cabbages, cauliflower, broccoli, Brussels sprouts, kale, kohl-rabi, peas, broad beans, turnips, carrots, onions, chives, lettuce, celery, parsley, cress, corn salad, endive, and rhubarb all gave good results.—*M. L. H.*

Alyssum, Sweet. By S. Mottet (*Rev. Hort.* vol. lxxxviii. pp. 160, 161; 1 fig. —*Alyssum maritimum compactum lilacinum* forms low-growing compact tufts, which are covered with lilac flowers for a period of two months. It is one of the most valuable of annuals.—*S. E. W.*

Anemone nemorosa, Variations in. By E. J. Salisbury (*Ann. Bot.* Oct. 1916, vol. xxx. no. cxx.; figs.).—Two varieties distinct from the common form are mentioned as being fairly numerous in some of the Hertfordshire woodlands, and for which the author has proposed the names *A. nemorosa* var. *robusta* and *A. nemorosa* var. *apetala*. The former differs from the normal type in the lighter green colour and larger size of the vegetative organs and in the perianth segments, which are broadest above the middle and rounded towards the apex. The latter bears inconspicuous flowers, which are small purplish-green structures, and it is noted that these plants are usually associated with the more deeply shaded situations, but as this character is maintained when the coppice in which the variety grows is felled, it is not considered a mere effect of inadequate illumination.—*G. D. L.*

Apple Aphis, Rosy. By A. C. Baker and W. F. Turner (*Jour. Agr. Res.* vii. pp. 321–343, Nov. 1917; plates).—The authors consider the proper name of this insect to be *Aphis malifoliae*, not *A. sorbi* as it is usually called. Other synonyms are *A. pyri* Koch, and *A. kochii* Theobald. The structure and life-history of the insect are dealt with at length. The eggs hatch (in Virginia) in the early half of April, and the first stem mothers begin to propagate about April 25. Five to seven generations occur on the apple (but in some cases the pest appears to be present all through summer). The first generation is wingless, and succeeding generations contain larger and larger percentages of winged forms. Migration to plantain (*Plantago lanceolata*) commences about May 20, and few remain on the apple after the end of June. There are from four to fourteen generations on the plantain. About the third week in September migration to the apple occurs and egg-laying thereon commences about the middle of October, continuing until the oviparous females are all dead, even into the latter part of December.—*F. J. C.*

Apple, Black Root-rot of the. By F. D. Fromme and H. E. Thomas (*Jour. Agr. Res.* x. pp. 163–173, July 1917; 3 plates, 1 figure).—The black root-rot of the apple is an infectious disease which has become very prevalent in Virginia, U.S.A. The chief symptoms are the formation of black incrustations on the surface of attacked roots, and it was found that the disease is infectious. Newly planted apple-trees on fresh land are very liable to this disease. The authors have isolated three species of *Xylaria* from affected roots. Of these, *Xylaria hypoxylon* proved to be the most deadly species. Since this species of fungus is commonly met with on stumps of forest trees, land which has been already under cultivation is more suitable for apple-growing than newly cleared land.—*A. B.*

Apple, Effects of Blackrot Fungus, Sphaeropsis malorum, on Chemical Composition of. By C. W. Culpepper, A. C. Foster, and J. S. Caldwell (*Jour. Agr. Res.* vii. pp. 17–40, Oct. 1916).—The variety 'Red Astrachan' was used in the experiment. The fungus caused considerable reduction in amount of total solids, and various changes occur in the products extractable with alcohol, etc., but there is no reduction of acidity by formation of purin and hexone bases as was found in attacks of *Glomerella rufomaculans*, though the acidity rapidly diminishes. Mineral matter is brought into solution, and sugars rapidly decrease. Starch is not attacked. The alcohol content is largely increased.—*F. J. C.*

Apple, Laying Out the Orchard. By J. Farrell (*Jour. Agr. Vict.* Sept. 1916, pp. 522–532).—Well-described and illustrated methods for setting out commercial orchards, by the use of a wooden frame to set off the right angles, and fencing wire of No. 8 or 10 gauge, with distances (say 20 feet apart) marked by a piece of finer wire soldered on to the wire, a loop being made at each end, about 5 feet from the end marks, into which two iron pegs or crowbars are placed to hold the wire, when fixed in position for marking off.—*C. H. H.*

Apple Stocks, Double-worked. By J. Farrell (*Jour. Agr. Vict.* Oct. 1916, p. 578).—In Victoria the stocks mostly used are 'Northern Spy' and 'Winter Majetin,' as they resist the attack of woolly aphis. A double-worked blight-proof stock consists of two portions of the blight-resistant variety intended for use. A piece of root is employed as a "starter," on which is grafted a scion, or portion of yearling wood, which produces the shoot on which the desired variety may be either budded or grafted. Double-worked 'Northern Spy' root grafts are the stocks recommended, as they are most favoured by the fruit-growers in Victoria. A piece (A) of 'Northern Spy' root 2½ inches long is cut with a grafting knife and tongued; a piece (B) of yearling wood of the same variety 4 inches long is cut and tongued. The root and scion are then placed together and the tongues put into each other to make a firm graft, and tied with a piece of soft string. The root graft is planted during early spring, the top bud of the scion is allowed to project above the soil level. The sap commences to move in the starter, fibrous roots are thrown out, and cambium connexion formed between stock and scion; fibrous roots are also thrown out at the buds under the soil in the stock, and from these the future root system of the tree is mainly formed. The shoot is budded with the desired variety, or should this miss the stock is cut and top-grafted about 9 inches from the ground.—*C. H. H.*

Apple Tree Tent Caterpillar, The. By A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 662; May 1915; 7 figs.).—This species is subject to attack by numerous parasitic and predaceous insects. The caterpillars are also subject to destruction by a bacterial disease, especially when nearly full-grown. *V. G. J.*

Apple Trees, A Blossom Wilt and Canker of. By H. Wormald, M.Sc., A.R.C.Sc. (*Ann. Appl. Biol.* iii. April 1917, pp. 159–204; 8 figs.).—Great loss is caused to fruit-growers in the S.E. of England by a "Blossom Wilt and Canker of Apple Trees." The open flowers are the seat of infection, as the fungus attacks the tissues of the flowering spur, destroying the leaves and inflorescence, sometimes infecting the branch and cankering it. Pustules of conidia are produced in the winter and spring following from the dead spurs, and the falling conidia cause a new outbreak through infecting the opening flowers. Infection does not appear to take place through wounds.

The disease may be checked by cutting out all dead spurs and cankers before the blossoms open. To be effective, the brown and dead wood and bark must be removed thoroughly.

Spraying must be done before the flower buds open, and must be capable of destroying the powdery conidial stage, or at least of preventing the conidia from falling during the time when the blossom is open and receptive. Lime-sulphur wash has not given favourable results. Bordeaux mixture, on account of its slightly better adhesive properties, gave a little better result. Ammonium sulphide solution (see *Jour. Agr. Sci.* vii. pp. 473–507) and soft soap, applied as late as possible before the flowers opened, killed the surface layers of the pustules. The temporary prevention of the fall of conidia in this way during the critical period of infection offers the most promising field for further experiment.

The causal organism is a grey *Monilia*, included under *Monilia cinerea* Bon, distinguishable from *M. fructigena*.—*R. C. S. R.*

Aquilegia, A New Hybrid. By T. D. A. Cockerell (*Bot. Gaz.* Nov. 1916, pp. 413).—The cross was made between *Aquilegia chrysantha* Gray (a garden strain) with *A. desertorum* (Jones) Cockerell, from Santa Fé Canyon, New Mexico.

The following is a description of a typical flower:—

Flower nodding. Sepals about 19 mm. long and 8 mm. broad, pink, with a faintly purplish shade, or the apex distinctly purplish. Petals 30 mm. long (to end of spur), 8 mm. wide near apex, broadly truncate and sub-marginate apically; apical 10 mm. cream colour, spur rose-pink; spur broader basally than in *A. desertorum.*

We may give it a simple Mendelian interpretation by saying that the dominant characters are the spur-length of *A. desertorum* and the flower width of *A. chrysantha.*—*R. J. L.*

Arsenate of Lime as an Insecticide. By W. M. Scott (*Jour. Econ. Entom.* viii. p. 194; April 1915).—Arsenate of lime would be considerably cheaper than lead arsenate, and could be made at home. The author and others report insecticidal results following its use equal to those obtained by the use of lead arsenate, generally with safety to the foliage, though occasional burning resulted. The material certainly merits trial against the lead arsenate, and can be made by adding sodium arsenate to slaking lime, decanting the liquid which contains caustic soda in solution before mixing with Bordeaux mixture, lime-sulphur, or water (2 lb. to 50 gallons) for use.—*F. J. C.*

Arsenates, Toxic Values and Killing Efficiency of the. By A. L. Lovett and R. H. Robinson (*Jour. Agr. Res.* x. pp. 199–207; July 1917).—This paper deals with the results obtained in a study of the relative toxic value of pure samples of lead hydrogen arsenate, basic lead arsenate, and calcium arsenate in poison sprays as insecticides.

It was found that lead hydrogen arsenate has a higher killing efficiency (upon caterpillars), at a given dilution, than either calcium or basic lead arsenate. A longer time is required to kill mature caterpillars than the small forms. All the arsenic devoured by the insects in feeding upon sprayed foliage is not assimilated, but a portion is excreted. This amount varies with the arsenate used; lead hydrogen arsenate was assimilated readily and most of the arsenic was retained in the tissue, but in the case of basic lead arsenate the greater amount was excreted. It was found that about 0·1595 milligram of arsenic pentoxide is required to kill 1000 small tent caterpillars, and about 1·84 gram of arsenic pentoxide to kill 1000 mature tent caterpillars, irrespective of the particular arsenate used as a spray.

Calcium arsenate is not suitable as a spray, because of its burning effects upon the foliage.—*A. B.*

Artichoke, Jerusalem (*Jour. Soc. Nat. Hort. Fr.* vol. xvii. p. 115, Aug. 1916).—This vegetable might profitably be much more extensively grown. It flourishes

in poor soil, can resist great cold, requires very little attention, and is both nourishing and generally relished. This list of good qualities seems to mark it out as a suitable war-time crop.—*M. L. H.*

Assimilation of Iron by Rice in Nutrient Solutions. By P. L. Gile and J. O. Carrero (*U.S.A. Jour. of Agr. Res.* vol. vii. No. 12, Dec. 1916, pp. 503–528).—Rice was grown in acid, neutral, and alkaline solutions with different quantities of iron to determine if rice was sensitive to the reaction of the substance, and if this reaction influenced the assimilation of iron.

In nearly all cases growth was much better in the nutrient solutions containing ·008 grm. of iron per litre than in solution containing ·002 grm. per litre. $FeSO_4$, ferric citrate, and ferric tartrate afforded sufficient iron when used in acid and alkaline solutions for the growth of the plants.

Plants grown in the acid solutions contained the highest percentages of iron; those in neutral solutions contained higher percentages of iron than those in alkaline solutions, but the percentages of nitrogen, phosphoric acid, lime, magnesia, and carbon-free ash in plants did not vary appreciably in six different solutions.

The amount of available iron could not be determined analytically because of the impossibility of distinguishing between colloid and soluble iron. Calculations, however, showed that the concentration of available iron in many cases must have been less than one part in 10,000,000 of solution.

A short bibliography is appended.—*A. B.*

Astilbe Tacqueti. By S. Mottet (*Rev. Hort.* vol. lxxxviii. pp. 188–189; 1 plate).—*Astilbe Tacqueti* was raised from seed collected in east China. It is a hardy and vigorous plant about thirty inches high. About the beginning of July it bears numerous small flowers of a lilac hue in panicles.—*S. E. W.*

Beech Disease caused by Bulgaria polymorpha. By R. J. Tabor and K. Barratt (*Ann. Appl. Biol.* iv. p. 20; Sept. 1917).—The symptoms of the attack upon the beech are the exudation of a brown gummy liquid from various points in the bark, the bark is killed, and the life of the tree threatened; the living diseased trees are rendered unsightly by the gum. The parasitism of the organism was investigated, and the indications point to it being a bark parasite, but healthy young trees resisted infection.—*F. J. C.*

Bees, Isle of Wight Disease (Nosema apis), **Recommendations to Reduce this Disease.** By F. R. Beuhne (*Jour. Agr. Vict.* Oct. 1917).—(1) Not to locate hives in shady places. (2) To keep the ground around the hives bare and clean. (3) To keep water from penetrating the hives during winter. (4) To re-queen all colonies which, from no visible cause, lag behind the average, and are therefore possibly disease carriers. (5) To use for re-queening only queens from stocks which, by their yields of honey, due to the longevity of the workers, have proved their resistance to disease.—*C. H. H.*

Berberis levis. By Dublin (*Irish Gard.* xii. p. 20).—A desirable robust Chinese shrub growing to the height of six feet or more. Produces yellow flowers in clusters in the spring.—*E. T. E.*

Black Currant Eelworm. By Miss A. M. Taylor (*Jour. Agr. Sci.* vol. viii. 2, pp. 246–275; 1 fig., 1 pl.).—This ecto-parasite, a member of the group Anguillulidae, has hitherto escaped attention, owing to the fact of its close association with the black currant mite with which it lives in unison. It has recently caused much damage in plantations near Cambridge. The symptoms produced by the two parasites are very similar in certain respects, and the nematode is responsible for at least an equal share of the damage hitherto attributed wholly to the mite. Both attack the bud; in the life-history of both there is a period when a nomadic existence is led, while the buds are in a rudimentary condition, followed by a longer period spent in the developing and mature buds. Both gain entrance to the buds between the scale leaves; both reproduce throughout the year. On the other hand, the nematode does not produce "big-bud." Also bud leaves attacked by the worm show isolated discoloured areas, which are moist and transparent, and these appearances may occur throughout the year, whereas the discoloured tissue due to the mite is opaque, and is usually noted only in the fall of the year. Further, the mites migrate from the buds definitely in the spring (there may be, however, individual migration in the summer and autumn). The nematodes, on the other hand, are driven to migrate at frequent intervals as soon as the buds which they have attacked die.

The diameter of the nematode does not at the most exceed half that of the mite. Hence it has no difficulty in entering the bud. They are gregarious,

reproduce throughout the year, and owing to their extreme lethargy may easily be overlooked when sought for by the aid of a magnifying glass. When very numerous in the bud and about to migrate, they have the appearance of fragments of cotton-wool at the bases of the bud leaves, which fragments are visible to the naked eye. Examination with a lens shows that these white fluffs are colonies of worms in compacted masses. Placed in water the fluffy fragments disintegrate, and the separated nematodes wriggle actively. Migration from bud to bud occurs only if the requisite degree of moisture—rain mist, or heavy dew—is present. Destruction of attacked buds is rapid, especially in the spring, when the buds are minute: the consequent efforts of the tree to produce new wood result in an irregular growth, which with the accompaniment of dead shoots and shrivelled bark is typical of the presence of the eelworm. The worms do not invade the buds if the stems are kept dry, but they can, on the other hand, penetrate the soil and infect the moist basal buds below the surface. Attempts were made to ascertain whether the red currant and gooseberry could be infected by the eelworm. It was found that after inoculation the worms were present in the buds in limited numbers, but that on the whole the buds were normally developed. These plants, it is therefore concluded, are uncongenial hosts of the nematode.

It having been suggested to the author that the parasite might be identical with *Aphelenchus fragariae*, which causes the rather rare disease known as Cauliflower Disease of the Strawberry, attempts were made both in the greenhouse laboratory and in the field to infect strawberry plants with the nematode. The results were on similar lines to those in the case of gooseberries and red currants, *i.e.* some infection took place under greenhouse conditions, but the development of the strawberry plants was unaffected. In the field where the choice of hosts was between black currant and strawberry, the latter was always free from the worm.

The Anguillulidae, under unfavourable food conditions, may become desiccated, and in this condition may remain in a state of suspended vitality for months or years. A similar state is induced if twigs of black currant infected with the black currant eelworm are kept dry. After nine months' desiccation, followed by immersion in water, very few of the nematodes are found to be alive. Shorter periods of desiccation—six weeks up to six months—appear not greatly to affect the worms, which on moistening for one to two hours are found to have returned to the normally active state. As so lengthy a dry period as nine months does not occur in the case of black currant bushes, it is clear that under field conditions the mortality among the nematodes due to this cause is negligible.

Full details of the morphology of the nematode are given, illustrated by a plate of ten figures. It is provisionally assigned to the genus *Tylenchus* with the specific name *ribes*.—*J. E. W. E. H.*

Black-Rot, Leaf-Spot, and Canker of Pomaceous Fruits. By L. R. Hesler (*U.S.A. Exp. Stn., Cornell, Bull.* 379, August 1916, pp. 50–148; 20 figs., 8 plates).—This is primarily a disease of the Apple (*Pyrus Malus* L.), but it affects other trees, such as the Pear (*P. communis* L.), the Quince (*Cydonia vulgaris* Pers.), and the Crab Apple (*P. coronaria* L.) showing similar symptoms of the disease.

The causal organism is *Physalospora Cydoniae* Arnaud and it reproduces by ascospores contained in perithecia, as well as by pycnidia and sclerotia.

Certain varieties of apple—'Esopus' and 'Twenty Ounce'—are more susceptible to canker than are other varieties, but 'Twenty Ounce' is one of the best varieties in New York.

It is interesting to note that a fungus *Helicomyces Sphaeropsidis* Potebnia, has been found living as a parasite upon the conidia of *Physalospora Cydoniae*, and that infection takes place when the host fungus is in the macrophoma stage.

A very full bibliography is appended.—*A. B.*

Bones: How to make into Manure (*Queensland Agr. Jour.* p. 291; Nov. 1916).—Bones, which when properly treated form a valuable fertilizer, may be readily reduced to powder without the aid of a crushing mill. A simple plan is to pack the bones, layer by layer, with fresh wood ashes in a barrel, and keep the mixture moistened for some months. A quicker method is to boil the bones in an iron or copper boiler with strong caustic lye. The proportion of bones and lye to be used is, roughly, 15 parts by weight of bones to 5 of caustic soda, or 7 parts by weight of caustic potash dissolved in 15 parts by weight of water. The boiling should be done for two or three hours. But even without boiling, the bones will become disintegrated by being simply kept in the caustic liquor for about a week. Another method of softening bones is by mixing them in heaps with

quicklime and loam. A layer of loam 4 inches deep is first spread, and on this is placed a layer of bones 6 inches deep, and above this a layer of quicklime 3 inches deep. The layers of loam, bones, and quicklime are repeated till the heap reaches a convenient height, when it is covered all over with a thick layer of earth. Holes are then bored in the heap from the top, and water poured down them to slake the lime. This mass will become hot, and remain so for two or three months, after which the bones will become friable, and the whole heap may then be mixed up and spread as manure on the land.—*C. H. H.*

Bordeaux Mixture, The Influence of, on the Rates of Transpiration from Abscissed Leaves and from Potted Plants. By W. H. Martin (*U.S.A. Jour. Agr. Res.* vol. vii. No. 12, Dec. 1916, pp. 529–547).—The results of these experiments confirm the statement that the rates of transpiration from abscissed leaves and from potted plants are materially increased by an application of Bordeaux mixture. A surface covering of dry powdered $CuSO_4$ was less effective in accelerating rates of transpiration than a surface film of Bordeaux mixture, but was more effective than a film of $BaSO_4$.

The effect was greater in the case of abscissed leaves than in the case of leaves of potted plants.

The increased rate was immediately observed after the spray had dried upon the leaves; the highest rate occurring during the first two hours after spraying. *A. B.*

Brown Spot on 'Emperor' Mandarin. By G. P. Darnell-Smith (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 190–196).—To exterminate Brown Spot (*Colletotrichum gloeosporioides*) on 'Emperor' Mandarins, prune away diseased and dead wood, and spray with Bordeaux mixture composed of 6 lb. of copper sulphate, 4 lb. of lime, and 50 gallons of water. When the disease has been got under control, a spray of half the strength may be used. Bordeaux is more efficient than formalin, copper sulphate, or potassium sulphide.—*S. E. W.*

Buddleia asiatica. By A. O. (*Irish Gard.* xii. p. 36).—An attractive plant for clothing bare pillars in large conservatories. Flowers not large but freely produced, and plants easily propagated by cuttings in March. First introduced from India 1874, but more recently from China by E. H. Wilson. *E. T. E.*

Cabbage and Allied Crops in Connecticut, Insects Attacking. By W. S. Button and Q. S. Lowry (*U.S.A. Exp. Stn., Conn., Bull.* 190; January 1916; 17 figs.).—Many of the insects described are of European origin. For all the leaf-eating insects the authors recommend spraying or dusting the plants with arsenate of lead, which is perfectly safe before the plants are headed. When nearly ready to harvest, it is advisable to dust the plants with Pyrethrum or some other fine dust, applied with a blower or powder gun. With regard to the cabbage-root maggot (*Phorbia brassicae* Bouché), the best remedy is to place discs of tarred paper round each plant as soon as it is set out. These discs lie flat on the ground and prevent the female fly laying eggs on or near the stem just below the soil surface. The second most effective method of control is to pour into a surface depression around the stem of each plant about three ounces of crude carbolic acid emulsion made to the following formula:—

Hard soap, 1 lb.; or soft soap, 1 quart.
Boiling water, 1 gallon.
Crude carbolic acid, 1 pint.

Dissolve the soap in the boiling water, add the acid, and mix well. This mixture thickens on cooling, and should be diluted with thirty times its bulk of water before using.—*V. G. J.*

Cabbage Butterflies. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1917; pp. 4–5).—Ravages of larvæ of cabbage white butterflies in S. Wales 1914, among garden crucifers and swedes. Broccoli and sprouts were chiefly damaged on the sunnier slopes, the upper parts of fields and similar hot, dry situations, while gardens and fields in damp situations, near rivers &c., were least affected.

Farmers reported broadcasting lime and soot were without avail, but Keating's powder (Pyrethrum) had given excellent results upon cabbage. Commencing on September 28 several rows were treated with soot dustings, brine waterings, and dustings with Pyrethrum, respectively. The first two gave little benefit, but the last was rapidly effective in eradicating the pest.—*R. C. S. R.*

Cabbage Maggot, Biology and Control of the. By W. J. Schoene (*U.S.A. Exp. Stn., New York, Bull.* 419, March 1916, pp. 99–160; 8 plates, 3 figs.).—For more than eighty years the cabbage maggot (*Phorbia brassicae* Bouché) has been regarded as the most important injurious pest of cruciferous vegetables, such as cabbage, radish, cauliflower, and turnip. The damage it causes fluctuates from year to year. Like its host, it attains maximum development in a cool moist climate. A full description of the various life stages of the insect is given. The egg is deposited on or near the plants, and three to five days later the larva appears and attacks the root or part of the plant devoid of chlorophyll. The larva matures in eighteen to twenty days, and then enters the soil to pupate. The pupal stage may last from twelve to eighteen days or may be prolonged for several months (the insect hibernating). The females begin to oviposit soon after emerging, probably within three to five days. Adults may live for five or six weeks. With favourable conditions, there are three broods and perhaps a partial fourth. For the maggot to occur in great numbers, the presence both in spring and autumn of large acreages of succulent cruciferous roots is necessary. As regards treatment, the use of cheesecloth screens proved very satisfactory in securing cabbage seedlings free from injury, provided that the coverings were fly-proof. Tar-paper discs also proved effective, but in the open field the sticky surface soon became covered with dust and ceased to be of use. The removal of all crop remnants and the destruction of cruciferous weeds will lessen the numbers of the insect.—*F. G. A.*

Calcium and Magnesium Compounds, their Influence on Plant Growth. By F. A. Wyatt (*Jour. Agr. Res.* vi. pp. 589–620; July 1916; plates).—The author refutes the magnesium-calcium-ratio theory of plant growth, but shows that certain magnesium salts added to soils may produce the condition known as magnesium sickness characterized by the yellowing of the uppermost leaves of plants, the lower remaining green.—*F. J. C.*

Calcium Cyanamide as a Manure, Some Conditions affecting the Value of. By T. D. Mosscrop (*Jour. Agr. Sci.* viii. pt. 2, pp. 178–181; March 1917).—An important drawback in the use of calcium cyanamide as a manure is its injurious effect upon germinating seed when it is first applied to the soil. Seeds of cos lettuce, turnip, and barley were germinated on porous tiles under bell-jars water-sealed from the outer air. Inside the bell-jars was placed calcium cyanamide mixed with water, with soil water, and with moist earth. The lettuce seeds did not germinate, and microscopic examination showed a blackening of the cotyledons within the testa. With 1 gram only of calcic cyanamide within the jar the germination of the turnip and barley seeds was not greatly affected, but with as much as 4 grams marked inhibition was observed. The blackening action is by the condition of the experiment due to some volatile decomposition product of nitrolim, and further experiments showed that the action is not due to cyanamide, nor to dicyanamide, nor to cyanamide carbonate, but simply to ammonia, which with carbon dioxide and acetylene (a trace) is the gaseous product resulting from the action of water on nitrolim. Pot experiments showed that the injurious action had ceased eight days after application of the nitrolim to the soil. Oily seeds are affected little or not at all.—*J. E. W. E. H.*

Calcium Phosphates, The Solubility of, in Citric Acid. By A. A. Ramsay (*Jour. Agr. Sci.* viii. June 1917).—It is generally held that these phosphates exist in the state of mono-calcic phosphate soluble in water, di-calcic phosphate or reverted phosphate soluble in citric acid, and tri-calcic phosphate soluble in neither water nor in citric acid. The author was unable to purchase the pure tri-calcic compound: the calcic phosphate of the British Pharmacopœia was found to be a mixture of the tri- and di- compounds; di-sodic phosphate added to ammoniacal calcic chloride does not give it, but a mixture of the di- and tri- compounds, together with calcic hydrate and a similar mixture, is given by bone ash dissolved in hydrochloric acid and precipitated by ammonia. The author finds that pure tri-calcic phosphate is obtained by acting on one equivalent of pure pentoxide of phosphorus with three equivalents of calcic oxide. If, however, only two equivalents of calcic oxide are added, the product is not the di-calcic salt but a mixture of di- and tri-calcic phosphates. The pure tri-calcic compound is found to be completely dissolved by four separate thirty-minute extractions with 2 per cent. citric acid solution, but the separate extracts do not contain phosphoric acid and lime in the proportions required by the formula for tri-calcic phosphate. The citric acid in fact is more correctly a solvent for lime than for phosphoric acid, as is shown by the fact that by the simple addition of calcic carbonate to the tri-calcic phosphate the solubility of the latter in citric

acid is decreased by several per cents. From the preceding facts it seems clear that the manurial value of a phosphate cannot be determined by a 2 per cent. citric acid solvent in the manner prescribed, and that further investigations are necessary.—*J. E. W. E. H.*

Callitris oblonga. By A. B. Jackson (*Gard. Chron.* July 7, 1917, p. 3; with fig. p. 7).—A rare species peculiar to Tasmania. The plant 8 feet high at Rostrevor, planted in 1893, appears to be the only specimen in Ireland, although it seeds freely.—*E. A. B.*

Carbohydrates, The Estimation of. V. By W. A. Davis (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—Contrary to the view almost universally held, basic lead acetate does not precipitate laevulose from solution. If it be added in excess to a solution of pure laevulose and at once precipitated, practically 100 per cent. of the sugar is recovered. If left for varying periods of time, an increasing amount of laevulose disappears and Lobry de Bruyn's glutose is found in increasing quantities. The conversion is accelerated by heat. On the other hand, digestion of maltose or dextrose with basic lead acetate leads to no loss of these sugars—an important distinction from the practical standpoint.

J. E. W. E. H.

Celery-Rot Bacillus, The. By H. Wormald (*Jour. Agr. Sci.* viii. pp. 216–245, March 1917; 2 plates).—The celery plant is susceptible to a bacterial attack, producing in the affected tissue a brown soft rot, which may be so pronounced that a high percentage of the plants may, on lifting, prove to be quite useless. Infection is brought about through a puncture or on a raw surface: the organism appears to be unable to attack uninjured living organs, nor does it produce infection through water pores. The organism will also produce a soft rot in radish, carrot, potato, artichoke, turnip, and swede. Earthing up renders celery plants less resistant: wrapping the plants in paper tends to protect them from the gnawing of snails and slugs, and therefore indirectly from infection.

Details are given of the action of many antiseptics of various strengths. A 0·1 per cent. solution of copper sulphate and a 0·01 per cent. solution of formaldehyde proved to be effective germicides.

The organism is yellowish, sensitive to desiccation, typically bacilliform, but under certain conditions may either be coccus-like or develop long filaments, and can grow in a synthetic medium containing either sugar or pectin as the sole carbon compound. It is possibly a variety of *B. carotovorus*, and the author has named it *B. apiovorus*.

A bibliography at the end of the paper gives 47 references.—*J. E. W. E. H.*

Chafer Beetles. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1917, p. 8).—The garden chafer, *Phyllopertha horticola*, is locally exceedingly abundant at times in the Aberystwyth area. An inhabitant of the "slope land," it swarms about the sunny sides of the mountain valleys, the adults in June, the larvæ in August–September. Rooks render great service in devouring the pest, and this chafer is largely controlled by these birds.

R. C. S. R.

Cherry By-Products, The Utilization of. By Frank Rabak (*U.S.A. Dep. Agr., Bull.* 350, Washington, March 1915).—Fruit-packing as an industry has been enormously developed of late years in the United States.

Fifteen thousand tons of the sour red cherry alone are annually exported from Californian orchards. The fruit is stoned before packing, and hitherto the stones and a great quantity of juice are not only wasted, but are a source of expense in carting away. Chemically, the stones contain the same constituents as peach and almond stones in varying quantities, and experiments show that both fixed and volatile oil can be extracted from them. The resulting mass by analysis might be a useful feed for stock. This bulletin contains a description of the methods of extraction used, and suggests ways of making use also of the surplus juice.—*M. L. H.*

Chicory, Witloof, Culture and Forcing of. By J. W. Wellington (*U.S.A. Exp. Stn., New York, Bull.* 418, March 1916, pp. 89–98; 3 plates).—The author suggests that Witloof Chicory, of which large quantities were imported from Belgium and France previous to the war, should be grown and forced by American gardeners. It is an improved variety of the common Chicory, *Cichorium Intybus* Linn., a native of Europe, but now found naturalized in many parts of America, and often a pernicious weed. It is easily grown from seed. The size of head when forced was found to be in accordance with the size of root

used. Roots having a crown diameter of from one to two inches produced the greatest number of marketable heads. Sand proved a very satisfactory covering for the roots; it blanched the leaves perfectly and promoted the formation of compact heads. A steady temperature of about 60° F. appeared to be the best; lower degrees were found satisfactory but required more time to mature the crop. It is necessary to keep the soil moist. The time required for forcing the crop was fifteen days.—*F. G. A.*

Chinese Plants, New. *Arbores Fruticesque Chinenses*, Novi, I. By Camillo Schneider (*Bot. Gaz.* vol. lxiii., No. 5, May 1917, pp. 398–405).—Detailed botanical descriptions are given of the following new species and varieties:—

(1) *Deutzia* (Sect. Eudeutzia, subsect. Stenosepalae Schn.) ***Rehderiana***, sp. n.
(2) *Spiraea* (Sect. Chamaedryon Ser.) ***teretiuscula***, sp. n.
(3) *Malus pumila* Mill, var. ***subsessilis***, n. var.
(4) *M.* (Sect. Docyniopsis Schn.) ***docynioides***, sp. n.
(5) *Sorbus* (Sect. Aria) ***Ambrozyana***, sp. n.
(6) *S. hupehensis* Schn. var. ***aperta***, n. var.
(7) *S. hupehensis* var. ***obtusa***, n. var.
(8) *S. hupehensis* var. ***laxiflora***, n. var.
(9) *S. Prattii* Koch. var. ***tatsienensis***, n. var.—*R. J. L.*

Chinese Plants, New. *Arbores Fruticesque Chinenses*, Novi, II. By Camillo Schneider (*Bot. Gaz.* vol. lxiii. No. 6, June 1917, pp. 516–523).—Further descriptions of the following new plants are given:—

(1) *Clematis chrysocoma* Fr. var. ***sericea***, n. comb.
(2) *C. Delavayi* Fr. var. ***calvescens***, n. var.
(3) *C. urophylla* Fr. var. ***obtusiuscula***, n. var.
(4) *C.* (Sect. Viorna Prtl., ser. Connatae Koch.) ***Kochiana***, n. sp.
(5) *Mahonia* ***Alexandri***, n. sp.
(6) *M.* ***caesia***, n. sp.
(7) *M.* ***philippinensis***, n. sp.
(8) *M.* ***nivea***, n. sp.
(9) *Schizandra grandiflora* var. ***cathayensis***, n. var.
(10) *S. grandiflora* var. ***rubriflora***, n. comb.—*R. J. L.*

Citrus Disease, A New Bacterial. By H. A. Lee (*Jour. Agr. Res.* ix. April 1917, pp. 1–8; 3 plates).—A new disease of Citrus trees, endemic to Northern and Southern California, shows black discoloured areas on the leaves near the junction of the leaf blade and the petiole, and causes the leaves to fall prematurely. The disease frequently spreads to the twigs and causes them to become shrivelled and black. The symptoms resemble frost injury, but it has been found that it is caused by a bacterial organism (*Bacterium citrarefaciens*), apparently a new species.

The bacterium exists in the parenchyma and destroys cell structure, forming large pockets filled with bacterial masses. The germ does not enter the vascular bundles. Cultures on artificial media show the bacterium can liquefy gelatine and forms white smooth glistening colonies on agar. The bacterium is 1·8 by ·6 μ and is flagellate, readily stained with aqueous fuchsin, carbol fuchsin, and gentian violet, is Gram negative and not acid fast.—*A. B.*

Citrus Thrips, Control of the. By J. R. Horton (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 674; July 1915; 7 figs.).—Of the large number of combinations of insecticides tested, the following have given the best results:—

1. Commercial lime-sulphur.
2. Sulphur-soda solution.
3. Commercial lime-sulphur and black tobacco extract (40 per cent. nicotine sulphate).
4. Black-leaf tobacco extract (40 per cent. nicotine sulphate, 1 part to 800 parts water).—*V. G. J.*

Clematis Stem-rot and Leaf-spot caused by Ascochyta clematidina. By W. O. Gloyer (*Jour. Agr. Res.* iv. pp. 331–342, July 1715; plates).—The die-back disease of Clematis, well known in England, has been investigated by the author, who found *Ascochyta clematidina* always associated with it. The disease affects various hybrids and species differently. The hybrids grown outdoors are affected by stem-rot, while in the greenhouse, "where the cuttings are propagated," they are attacked by a leaf-spot as well. *Clematis paniculata* shows both forms of rot. The fungus was isolated in pure culture, and reproduced the disease when inoculated into the stems of *C. Jackmanni* and *C. paniculata*, and

also when the spores were sprayed upon healthy plants of the latter. Spraying (except of the young plants in the frames, where the advantage of the use of Bordeaux mixture was marked) proved of little benefit, but the removal of dead leaves and "stubs" is recommended, as well as the provision of ample means of climbing.—*F. J. C.*

Coccidae affecting various Genera of Plants. By E. E. Green (*Ann. Appl. Biol.* iv. p. 75, Sept. 1917).—A useful list extending to 14 pp. and only dealing with genera, which are arranged alphabetically, from A to C, is given. Economic entomologists will find this list of the greatest assistance in getting at the name of scale insects which come under their notice, and as an indication of what is known concerning the attacks of different scale insects upon plants.—*F. J. C.*

Coccidae of Australia (continued). By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 809–816, 883–888; vol. xxviii. pp. 135–140; 8 figs.)—The continuation of the list of Australian scale insects includes: *Pseudoripersia turgipes, Erium globosum, Dactylopius acaciae, D. affinis, D. albizziae, D. aurilianius, D. australiensis, D. bromeliae, D. ericicola, D. grevilleae, D. herbicola, D. hibbertiae, D. lanigerus, D. lobulatus, D. longispinus, D. macrozamiae, D. similans, D. zamiae, Pseudococcus casuarinae, P. nivalis, Epicoccus acaciae, Lachnodius eucalypti, L. hirtus, L. lectularius, Rupersia leptospermi,* and *Antonina australis.*

The following new species were observed: *Erium frenellae*, found on the foliage of the desert cypress (*Frenella robusta*) in New South Wales. The adult female is enclosed in an elongated white sac. She is broadly oval, of a yellowish brown colour, with short legs, and seven-jointed antennae. The epidermis is covered with rod-like processes and small round orifices. *E. newmani*, from Darlington, West Australia, resembles *E. globosum*, but is larger. *Dactylopius candidus*, found on *Acacia decurrens* near Sydney, resembles *D. acaciae*, but differs from it in the structure of the antennae, which are eight-jointed, and in its very small anal tubercles.

D. hilli lives on the leaves of a wattle at Darwin in the Northern Territory. The adult female is pale brownish yellow with mealy secretions fringed with woolly filaments. It is broadly oval and has eight-jointed antennae. *Pseudococcus stolatus* thickly covers the bark of *Mypopium deserti* with their oval white sacs. The adult-female is light brown, felted, ribbed with transverse lines, the margin fringed with short woolly filaments and has antennae with joints.—*S. E. W.*

Codling Moth, Late Broods of the. By B. S. Pickett (*U.S.A. Exp. Stn., Ill.*; June 1914; *Circ.* 171; 7 figs.).—The object of this circular is to call special attention to the urgent need for strenuous efforts to combat this insect during the late summer season. Two means of control are recommended, spraying frequently and thoroughly with arsenate of lead, and trapping the worms in bands on the trunks of the trees.—*V. G. J.*

Colorado Beetle, Control of the, Second Report. By L. B. Smith (*U.S.A. Dep. Agr., Virginia Truck Exp. Stn., Bull.* 17; Oct. 1915; 2 tables).—The experiments during the season of 1915 verify the more important points of the work done the previous season. Home-made Bordeaux mixture 50 gals., arsenate of lead 4 lb., and Paris green 1 lb., continue to give excellent results. Arsenate of lead paste at the rate of 2 lb. to 50 gals. Bordeaux proved very efficient in the destruction of the beetles. Calcium arsenate was tried, and the results indicate that it may prove of great value.—*V. G. J.*

Cone Beetles: Injury to Sugar Pine and Western Yellow Pine. By John M. Miller (*U.S.A. Dep. Agr., Bull.* 243, July 24, 1915).—The greater part of the damage to these pines is caused by small scolytid beetles, *Conophorus* spp. The common name of "cone beetles" seems most appropriate for these insects, as their life history and the damage caused by them relate entirely to the cones of the host trees.

Sugar-pine cones at the beginning of the second-year growth are about 2 to 2½ inches long and are attached to the limb by a stalk from 2 to 3 inches long. The parent adult beetle attacks the cone by boring into the stalk of the cone. The position of this initial entrance varies greatly; usually it is just above the base of the cone, but it may occur anywhere from the base of the cone to an inch or more above. The wound made by the beetle soon produces a flow of resin which gradually accumulates on the surface in the form of a small pitch tube. After boring into the centre of the stalk the beetle turns towards the cone and continues to extend its tunnel straight outward through the axis of the

cone. After it advances well into the heart of the cone the tunnel becomes the egg-gallery, and single eggs are deposited at intervals in notches excavated along the sides of the burrow. The entire length of the egg-gallery is packed with sawdust. Sawdust is also packed around the eggs in the egg notches.—*A. D. W.*

Corsican Pine at Lochnaw. By Sir Andrew N. Agnew (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 83–84; July 1916).—There is no tree which has come into general use in Wigtownshire during the last half-century which has proved so serviceable as the Corsican pine. At least that has been the experience on the Lochnaw estate, where it has been planted regularly for forty years. It is an extremely hardy tree, growing and thriving in the poorest soils and in the most exposed situations. The Corsican pine has the reputation of being difficult to establish, but it has given no trouble there. It is rather slow in taking hold of the ground, and is consequently apt to get a shake in stormy weather during its first year or two. But once this stage has been got over, it is the most reliable tree we have, making the best of any circumstances, and standing erect and unshaken in the teeth of the fiercest gales.

The first Corsican pine planted at Lochnaw was in the year 1853. It is now a well-grown tree, 62 feet in height, with a gently tapering stem measuring 5 feet 3 inches at 5 feet above the ground.

The two things that catch the eye at once in a grove of the *P. Laricio* are the upright figure of the trees and the cylindrical shape of the stems. These two characteristics seem to mark out the tree as being specially adapted for pit-wood. There has been a great demand for home-grown timber for pit purposes since the war began, and to a lesser degree the demand is likely to be a permanent one.—*A. D. W.*

Corylopsis Willmottiae. By A. O. (*Irish Gard.* xii. p. 37).—A fairly common plant in Western Szechwan, introduced from China by E. H. Wilson. A bushy deciduous shrub which should be planted on a warm south-west or west border. The soil should be light loam, leaf-mould, and peat. Propagate by layering in the summer.—*E. T. E.*

Creosoting, The Rüping System of. By W. P. Greenfield (*Quart. Jour. of Forestry*, x. pp. 29–36; January 1916).—On most well-managed estates of any size there is some method in vogue for preserving and extending the life of the timber used in estate buildings and for fencing and other purposes. Several methods have been tried for this end, such as impregnating with naphthalene, or painting with solignum &c., but the most common process is that of creosoting with heavy creosote oil. There are three different processes of creosoting—(1) by pressure—the most effective; (2) by immersing the timber in creosote and boiling for some hours; (3) by simple cold immersion.

The second method is most commonly in use on estates, because the initial expense of the boiler and tank is much less than that of the apparatus required to creosote by pressure. It affords very good results with certain species of timber, but in others there is not the same thorough saturation of the outer tissues as with creosoting under pressure.

Formerly ordinary oak and larch fence posts would be rotten in about seven to eight years, but, by creosoting under pressure, inferior timber such as spruce can be used instead of good oak, which can be sold. The author has seen spruce fence posts thus creosoted that have stood in the soil for fifteen years, and when dug up the edges of the part that had been in the ground were still sharp, and even the saw kerfs could be seen. Plain spruce would have been rotten in a very few years.—*A. D. W.*

Crown-gall, Mechanism of Tumour Growth in. By Erwin F. Smith (*Jour. Agr. Res.* viii. Jan. 1917, pp. 165–186; 61 plates).—The ultimate cause of all proliferation in crown-gall is the micro-organism, *Bacterium tumefaciens* Sm. and T., but the mere mechanical irritation due to the introduction of a few rod-shaped bacteria in the tissues cannot be the direct cause of the proliferation, since other species of bacteria either have no specific action when inoculated into plants, or some quite different action, such as the wilting of the foliage due to the multiplication of bacteria into the vascular bundles (e.g. *B. tracheiphilus*), or a soft rot of the shoots and tubers (e.g. *B. phytophthorus*). In each of these types of plant disease (tumour, wilt, or soft rot) the ultimate cause is a bacterial infection, but the immediate or proximate cause must be the chemical or physical actions of enzymes produced by the bacteria with a corresponding *reaction* on the part of the plant.

The author now thinks that growth is not the result of external stimuli, but rather it is due to the *removal of various inhibitions*; for, as he states, under

normal conditions the physiological brakes are on at all times, more or less, for all animals and plants, and only when they are entirely or largely removed in particular areas, do we observe an unlimited cell proliferation resulting in the hasty and peculiar growths known as neoplasms, or cancers. *The inhibition ...r is one that acts locally, disturbing tissue equilibriums within limited areas.*

If the cause of cell proliferation in crown-gall is due to substances liberated ...the cell by the parasite, they must be substances either identical with or at ...st not differing greatly in the physical or physiological action from those ...ting on the non-parasitized cell during normal growth and division. There is ...o evidence of chemical injury either in the tissues surrounding the crown-gall, ...r in the tumour cells themselves, since they grow and multiply with a rapidity ...sembling cells of normal young tissues. This removes from consideration ...ctively (killing) poisonous substances.

The questions to be answered are:

1. What are the products of the bacterial metabolism of *B. tumefaciens*?
2. Are any of these products capable of producing cell proliferation if injected nto the growing plant?

We know that growth of *B. tumefaciens* in culture media of grape sugar and Witte's peptone causes formation of ammonia and alcohol and acetic acid, as well as carbon dioxide and primary and secondary amines. This production of acids and ammonia suggested to the author that tumours might be formed by the injection of such substances into growing plants.

Experiments were therefore made by injecting into healthy *Ricinus communis*, and *Nicotiana Tabacum* and other species, various strengths of ammonia and ammonium salts; and in many cases tumours were formed. Some striking micro-photographs of Ricinus stems with tumour are shown.

The author concludes that these substances act *osmotically rather than chemically* in producing the tumours, and believes that as a result of the metabolism of an intracellular parasite or symbiont, together with the resultant counter-movements of water and food supply, such tumours are formed in crown-gall and presumptively also in animal neoplasms.

A short list of literature is appended.—*A. B.*

Crusoe's Island: Juan Fernandez. By J. Hutchinson (*Gard. Chron.* May 19–June 16, 1917; with 9 figs.).—An interesting account, chiefly historical. The botany is dealt with in the last portion, commencing on p. 240.—*E. A. B.*

Cucumber Disease caused by Choanephora Cucurbitarum. By F. A. Wolf (*Jour. Agr. Res.* viii. Feb. 1917, pp. 319–328; 3 plates).—The disease is commonly met with on cucumbers, where it causes a blight of the flowers and fruit rot. Infection appears to occur in the corolla and so passes into the ovary, being carried by various species of bees, beetles, and by wind. The fungus may also attack cotton, Althaea, and other Malvaceae. Sporangia, chlamydospores, and zygospores are produced, and may mature on cultures in 24 to 48 hours. Conidia are only known upon the affected parts of the diseased plants.—*A. B.*

Cupressus glabra. By A. B. Jackson (*Gard. Chron.* March 3, 1917, p. 95; with fig.).—The sixteenth of the critical notes on Conifers in this series. An American species related to *C. arizonica*.—*E. A. B.*

Cypress and Juniper Trees of the Rocky Mountain Region. By George B. Sudworth (*U.S.A. Dep. Agr., Bull.* 207, July 17, 1915).—Describes the distinguishing characters, distribution, and forest habits of all the known species of *Cupressus* and *Juniperus* growing within the Rocky Mountain region.

Arizona cypress grows in moist or rather dry, rocky, shaly, or gravelly soils on mountain slopes, and in the bottoms and on the sides of cañons, at elevations between 4,500 and 8,000 feet. It is especially fond of moist north-slope gulches and benches where the growth is more dense than in drier situations.

For the most part it forms pure or nearly pure stands, quite dense on the more favourable sites. The largest and best-formed trees occur on north slopes, in coves, and on benches in protected localities, where the soil is moist, deep, and more permeable, while short stunted trees are found in exposed places where the scanty soil is drier and less permeable.

Smooth Cypress.—The first reference to this new and handsome cypress was published in 1895, and was based on the discovery of a grove on Pine Creek at 'Natural Bridge,' Central Arizona, by Professor J. W. Toumey, who believed the tree to be a form of Arizona cypress. It was not distinguished from the latter tree, however, until February 1910, when it was named and described from a

grove of trees discovered by Mr. Arthur H. Zachau on the north slope of a tributary stream on the west side of the Verde River Cañon, about sixteen miles south-east of the town of Camp Verde, Arizona.

In general appearance the foliage of smooth cypress resembles that of the Arizona cypress, though the former species can be distinguished from the latter by the compact, narrowly oval, or somewhat pyramidal crown. The branches of smooth cypress, particularly of younger trees, are strongly upright.

Old trees grown in the open develop long, lower branches, which from their great weight are less upright than those of trees of the same age in a close stand. In height the trees range from 25 to 30 feet, and in diameter from 10 to 14 inches, though much larger trees probably exist. The trunk is slightly tapering, while the upper portion is sometimes divided into several branches, in this respect differing from the usual undivided stem of Arizona cypress. Only about one-fourth to one-third of the trunk is clear of branches. The most distinctive characteristic of this tree is its thin, smooth, dark purple-red bark.

Twelve tree junipers inhabit the United States. Nine of them occur within the Rocky Mountains, one is confined to California, and two are found only in the eastern United States.

Juniperus monosperma is commonly called merely 'cedar' or 'juniper.' The name one-seed juniper is appropriate because the small berries usually contain but one seed. This one-seed character, however, cannot be depended upon to distinguish *J. monosperma* from Utah juniper and *J. megalocarpa*, since both of these have one-seeded fruits.

It commonly produces several small trunks from a single root-stock, these stems varying in height from 6 to 20 feet and in diameter from 3 to 6 or more inches. The general appearance is often that of a low-crowned, overgrown bush. Single-stem trees are rare, occurring chiefly in protected places. Their height varies from 30 to 50 feet, or occasionally more, with a diameter of from 12 to 24 inches. In all cases the trunk is rather short, often deeply fluted, and widely buttressed. The wood of one-seed juniper is very narrow-ringed, hard, and heavy, with a slight cedar-like odour. The sap-wood is nearly white and from three-fourths to about two inches thick, usually much thinner in old trees than young. The wood of mountain cedar is moderately heavy (about 43 lb. a cubic foot, seasoned), rather hard, exceedingly narrow-ringed, and of a clear cinnamon-brown colour, interspersed with irregular paler streaks. The sap-wood is very thin, seldom more than one half of an inch thick. Freshly cut, dry, or green wood has a strong cedar-like odour. The heart-wood is very durable, and the best sticks are used for fence posts, telephone and telegraph poles, and light-traffic ties. It is used locally for fuel.

The wood of old trees is brittle and can be cut with an easily parted chip, qualities that make clear sections suitable for pencil wood.

The hard heavy wood of Utah juniper is generally very narrow-ringed, the rings in stunted trees being extremely narrow.

The sap-wood is very thick and white, while the heart-wood, of a light yellowish-brown colour, is less pungent in odour than that of other junipers. When thoroughly seasoned the wood is exceedingly durable. Utah juniper is too small and imperfect in form for commercial purposes, though where it is abundant the wood is much used for fuel and fence posts.

J. megalocarpa is one of the largest and best formed of our south-western junipers. It varies in height from 30 to 50 feet, and in diameter from 2 to 4 feet. The crown is compact, broadly pyramidal, with short, stout branches.

Alligator juniper is unique in the thick, sharply checkered bark of its trunk, the resemblance of which to the body scales of an alligator suggested its widely accepted common name, a characteristic which also distinguishes it sharply from all other native junipers. It is sometimes known as 'oak-barked juniper' and 'thick-barked juniper.'

The wood of alligator juniper is rather light, soft, brittle, and very narrow-ringed. The sap-wood is comparatively thin and of a pale straw colour; the heart-wood is light brown with a faint reddish tinge, irregularly marked with paler streaks.

Drooping juniper varies in size from a bushy tree 8 to 10 feet in height and 3 to 6 inches through to one of medium size from 29 to 25 feet tall and 12 to 20 inches in diameter. The best developed specimens have straight trunks, clear of branches for from 19 to 15 feet, and rather open, narrowly pyramidal crowns. Trees growing in dry, exposed places are rarely over 10 feet high, densely branched to the ground, and have a dome-shaped crown. The crown is composed of wide-spreading branches, at the ends of which the slender, drooping twigs give the tree a graceful, weeping appearance. In the case of trees growing in deep shaded cañon bottoms the drooping habit is especially pronounced, the pendent

branchlets often being a foot or more in length. Trees on exposed, drier slopes have very much shorter twigs.

The wood of drooping juniper is a clear yellowish-brown, with a rather thick layer of nearly white sap-wood. It is moderately hard and heavy, straight-grained, and very narrow-ringed.

Freshly cut wood has a strong cedar odour. Seasoned heart-wood is very durable, and has been extensively used locally for mine timbers and to a limited extent for fence posts.—*A. D. W.*

Cypress, The Southern. By Wilbur R. Mattoon (*U.S.A. Dep. Agr., Bull.* 272, September 27, 1915).—In the amount of lumber produced in 1913 cypress ranked sixth of the conifers. On account of the durability of the heart-wood and its moderate softness, which makes it easily worked, cypress is a wood of high value.

Cypress trees not uncommonly reach an age of over a thousand years, a height of from 120 to 130 feet, and a diameter above the basal swell of from 8 to 10 feet. Cypress is very persistent in growth, and is one of the few conifers which successfully sprout from the stump.

The total cut of cypress lumber in 1913, exclusive of lath and shingles, was 1,097,247,000 board feet. Since shingle and lath are made from the slabs and other kinds of " mill waste," and poles and ties are usually cut from small sizes not considered in the original estimates, the relation of cut to the total standing timber is unaffected by the lack of any figures for the smaller products.

It is resistant to decay when in contact with moisture.

It is used extensively for outside finish of buildings. On account of its freedom from taste and great durability it is used for tanks, vats, tubs, and wooden buckets in water storage, creameries, breweries, bakeries, and dye works, distilleries, and soap and starch factories. In the construction of greenhouses, where wood is subjected to extremes of heat and moisture, cypress is used probably more than any other wood. It is also a leading wood for pumps, laundry appliances, caskets, and coffins. Cypress is extensively used through the south in the construction of picket fences, which there remain the standard form of yard fence.

In the moist hot climate of the South, split cypress shingles have outlasted all other roofing materials commonly used, except the best grade of slate and tiles. While the ordinary sawed shingle is very durable, the relatively high value of cypress wood has resulted in cedar taking the lead as shingle material.

A. D. W.

Damping off of Coniferous Seedlings, The Control of. By C. Hartley and R. G. Pierce (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 453, Jan. 1917, pp. 1–32; 5 figs.).—The damping off of seedlings of coniferous plants is caused by the fungus *Pythium de Baryanum* Hesse, but *Fusarium moniliforme* Sheldon, and *Corticium vagum* var. *Solani* are often met with.

The disease causes much loss to nurserymen, and is primarily due to faulty cultivation. The importance of well-drained and aerated beds cannot be too much insisted upon in any control measures. Since the alkalinity of the soil favours the disease, the addition of lime or wood ashes should be carefully regulated. Soil disinfection, however, is by far the best method of combating damping off; and of these the most satisfactory are copper sulphate, zinc chloride, formaldehyde, sulphuric acid, etc. From the results obtained it is entirely possible and practicable to control this disease by soil disinfection.—*A. B.*

Diamond-Back Moth, The Life-History of (*Plutella maculipennis*). By H. C. Marsh (*Jour. Agr. Res.* x. pp. 1–10, July 1917; 2 plates).—The diamond-back moth (*Plutella maculipennis*, Curtis) is widely distributed in the United States. The larvæ are slender green caterpillars which attack numerous species of Cruciferae, and cause much damage to cabbage, cauliflower, rape, and turnip. The life cycle from egg to adult is completed in from 16 to 47 days.

Though this pest develops rapidly and is capable of considerable damage, it is usually held in check by parasites (ichneumons and *Microplitis*), and it may also be readily controlled by use of a spray of Paris green (2 lb.), soap (2 lb.), and water (100 gallons).—*A. B.*

Douglas Fir Pitch Moth. By Josef Brunner (*U.S.A. Dep. Agr., Bull.* 255, July 22, 1915).—The Douglas fir pitch moth much resembles, especially when in flight, certain wasps and flies.

The ground colour of the insect is black, with rich orange-red spots on the thorax, and with all the segments, except the last, banded with the same colour,

Underneath the whole insect is rich orange-red. Aberrations in colour are not frequent but exist, as the rearing of a wholly black female would indicate. The fore wings are transparent, opalescent, with black borders and prominent discal mark; the hind wings transparent, with slight discal mark and narrow black margin. Destruction of the larva is the only remedy that can be used to reduce an infestation. That the financial loss caused by *Sesia novaroensis* in Douglas fir product is great, and represents a greater leak in profits to manufacturers than any other avoidable item, is evident.—*A. D. W.*

Dusting and Spraying of Stock Nursery. By V. B. Stewart (*U.S.A. Exp. Stn., Cornell, Bull.* 385, Jan. 1917, pp. 338–361; 9 figs.)—The results of experiments during 1915 and 1916 indicate that the application of suitable powdered materials, with air as a carrier, will control certain leaf diseases of nursery stock as well as the commonly employed fungicide applied as a spray with water as a carrier.

The dust mixture of 90 parts of finely divided sulphur (200 meshes to 1 inch) and 10 parts of equally finely powdered arsenate of lead controlled the leaf diseases of horse-chestnut, currant, plum, cherry, quince, and rose in the nursery, and it is reasonable to suppose that similar results might be obtained for such diseases on mature trees in orchards.

The dusting method is more expensive, but the applications can be made in a much shorter time and more thoroughly than by spraying. Great care should be taken that only extremely finely ground materials are used in dusting mixture, as only such material will adhere to the foliage.

Experimental work is suggested to determine the value of this process in the control of other diseases and to lessen the cost as far as possible.—*A. B.*

Elsholtzia Stauntoni. (*Le Jard.* vol. xxxi. p. 825; 1 fig.)—*Elsholtzia Stauntoni* is a hardy shrub from Mongolia; it is about three feet high, and bears clusters of dark pink flowers in September and October. The leaves are aromatic.

S. E. W.

Endemism and the Mutation Theory, On. By H. N. Ridley (*Ann. Bot.* vol. xxx. no. cxx: Oct. 1916).—This paper controverts the opinions of Dr. J. C. Willis, published in "Ann. Roy. Bot. Gard. Perad." vol. iv. p. 2, and in "Ann. Bot." vol. xxx. 1916, p. 1, which deals with the rise and fall of species in Ceylon.

Dr. Willis's views are, briefly, that it will need a geological submergence or some such accident to kill out a very common species; that endemic species are the youngest, and of these the very rare the most recent; that all mutations are at once fixed, and the new form will not revert to the old one; that the theory of Natural Selection does not hold good.

The author quotes much evidence of a contradictory nature to the above. He cites the case of *Hedychium coronarium* L. and *H. flavescens*, both conspicuously abundant round Peradeniya and Kandy in 1888, which had entirely disappeared in 1913 without any apparent reason. He mentions, as examples of the destruction of species by enemies such as insects, fungi, and bacteria, the shrub *Lantana mixta*, at one time very common all over the waste ground in Singapore, which became comparatively scarce owing to the ravages of a small green bug that attacked the young fruits and thus prevented seed propagation; and the white-tailed rat of Christmas Island, counted in millions in 1886, but exterminated by 1904, supposedly by the brown rat introducing some bacterium (possibly the plague). The destruction of plants by man may be effected by plantations on a large scale and by destroying forests, and it may be brought about by climatic changes, *e.g.* the disappearance of the epiphytic fern *Polypodium sinuosum* from gardens of Singapore in 1905, after an extraordinary dry and hot spell lasting for a month or two, and the palaeobotanic records reveal innumerable instances of the extinction of species without any evidence of geological cataclysms in all such cases.

Endemics are the relics of an old flora rapidly disappearing. Natural Selection is the only theory at present which accounts for the adaptation of plants to their surroundings, and in this Dr. Willis's mutation theory entirely fails, for it cannot explain, for instance, why *Calophyllum inophyllum*, whose fruits are adapted for sea dispersal, occurs only on the sea shore, or why *Crinum asiaticum*, with flowers only fertilizable by a crepuscular sphingid, only opens its flowers exactly at the time of the appearance of the moth. With regard to mutations, every botanist knows that variations occur in plants which do not appear again in their offspring. The Lalang Grass of Malay is referred to as showing how a plant may adapt itself to nearly any conditions. It possesses an underground rhizome which can flourish at a depth of sixteen inches, and, if dug up, any

portion of it can reproduce itself; it is uninjured by heat or drought or forest fire, the leaves springing up again and growing an inch a day, and the author has seen it growing in the sulphurous smoke of a volcano in Java.—*G. D. L.*

Endothia parasitica and Related Species. By C. L. Shear, N. E. Stevens, and R. J. Tiller (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 380, Jan. 1917, pp. 1–80; 5 figs., 23 plates).—The importance of this group of fungi was first recognized when the chestnut blight fungus was discovered in 1904.

Endothia gyrosa (Schw.) Fr., the type of the genus, is divided into two sections. In section 1 the ascospores are short and pseudoseptate. There are two species: *E. gyrosa* found on five hosts—Castanea, Fagus, Quercus, Vitis, and Liquidambar; and *E. singularis* found on Quercus.

In section 2 the ascospores are oblong, fusiform, and uniseptate. There are four species and one variety, as follows:

Endothia fluens found on Castanea and Quercus in America, but in Europe has been found on Alnus, Carpinus, Ulmus, Corylus, Aesculus, Fagus, and Juglans.

Endothia fluens mississippiensis is only found on Castanea and Quercus, *Endothia tropicalis* found on Elaeocarpus, *Endothia longirostris*, and *Endothia parasitica*, which is found on Acer, Carya, Quercus, Rhus, and Castanea. On the last named it is actively parasitic, and is the cause of the chestnut blight.

A list of literature referring to this fungus is appended.—*A. B.*

Exosmosis, Studies on. By S. C. Brooks (*Amer. Jour. Bot.* Nov. 1916, vol. iii. No. 9, pp. 483–492).—The author points out that osmotically active substances may diffuse out of the cell, and this diffusion should be carefully noted in experiments on permeability when the turgidity of plant cells is used as a standard. This is often overlooked, and is an important source of error.

The conclusions drawn from a number of carefully devised experiments with the peduncle of *Taraxacum officinale* and specially prepared reagents are as follows:

Sodium salts increase the rate of exosmosis of other electrolytes from the protoplasm of *Taraxacum officinale*, while calcium salts reduce this rate.

A solution may be prepared consisting of a mixture of various salts in proportions such that, when used at a concentration isotonic with the protoplasm, it causes no appreciable alteration in the permeability of the plasma membrane of *Taraxacum officinale*.—*A. B.*

Farm Manures, Composition and Value of. By O. F. Jensen (*U.S.A. Exp. Stn. Mich., Circ.* 25, May 1915).—A useful treatise on farmyard manures, their values (1) as plant foods, (2) in relation to the kind of food given to animal, *i.e.* the value of certain foodstuffs when given to the animal, from the point of view of manure returned to the farmer.

The author states that the value of animal manures is not so much in their fertilizer content per ton, although this is very important, but owing to the humus present they make a great alteration in physical condition, by the power they have of increasing the aeration, warmth, and water-holding capacity of soils, and also their lasting effects.—*C. P. C.*

Farm Manures, Losses and Preservation of. By O. B. Winter (*U.S.A. Exp. Stn. Michigan, Circ.* 25, May 1915).—The author shows that under the best possible conditions at least 15 per cent. to 20 per cent. of the fertilizing elements are lost, but under the usual conditions in most farms as much as 50 per cent. is actually thrown away.

The worst floor for stables is one of puddled clay, closely followed by planks. It is suggested that all stables should have a water-tight bottom running down to a tank at rear.

Another heavy cause of loss is the practice of placing manure in heaps in the fields, and allowing such heaps to stand exposed to the weather.

Absorbents recommended for the prevention of avoidable losses are straw, fine earth, peat.—*C. P. C.*

Ferns, Eradication of, from Pasture Lands. By H. R. Cox (*U.S.A. Dep. Agr., Farm. Bulletin* 687, Sept. 1915; figs.).—The hay-scented fern (*Dennstaedtia punctilobula*) and the brake fern (*Pteris Aquilina*) have become serious pests in pasture land in the United States.

This bulletin gives an account of attempts to exterminate the hay-scented fern in the Eastern States. Spraying, cutting, and burning were all tried. In most situations cutting, or cutting and burning, are in practice the most effica-

cious and cheapest methods of subduing the growth. It is almost impossible permanently to eradicate the fern. Where spraying seems the most convenient cure, salt is the best material to use, 150 pounds of salt dissolved in 60 gallons or more of water to the acre for each application is sufficient.—*M. L. H.*

Fertilizer Problem from the Vegetable Grower's Standpoint. By C. E. Durst (*U.S.A. Exp. Stn., Illinois, Circ.* 182, May 1915; figs.).—Though the general principles of soil fertilization are of course always the same, there are marked differences in their application to vegetable and to farm crop production. In crop-growing, quantity and proper maturity are the only objects to be aimed at. The vegetable-grower has many more points to take into consideration. Relatively small differences in earliness, flavour, quality, or size may make all the difference in the value of his crop, and the margin of profit is so much larger as a rule that there is scope for more costly methods of cultivation. The whole question is reviewed.—*M. H. L.*

Fertilizers, The Nitrogen of Processed. By E. C. Lathrop (*U.S.A. Dep. Agr., Bull.* 158, November 1914).—Waste organic compounds or base goods such as hair, garbage, tankage, leather scraps, etc., are mixed with rock phosphate, and treated in a den with sulphuric acid.

The mass is allowed to stand for several days, until cool enough to handle. A hydrolysis of the proteins takes place, and the crude non-available types of nitrogen present are changed into much more available forms, and field experiments show that such fertilizers give equal and in some cases better results than dried blood and the other high-grade materials.

The above method is strongly recommended as a method of treating low-grade waste products to increase the sources of plant nutrition. The higher grades of organic compounds are becoming too scarce and expensive to be economical as plant foods, this being due largely to their use as animal and poultry foods.
C. P. C.

Flea Beetles. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1, 1917; pp. 6–7).—These pests appear to wait the advent of suitable crops and dry, sunny weather, when they multiply rapidly. Heavy rain limits or ends their ravages. Young root crops on dry slopes and hill-sides are generally most damaged, and delay in growth, with conditions of weather favouring the beetle, may cause total failure of first sowings and damage to the second.

Comparatively few complaints were received from lands regularly dressed with lime and basic slag. Soaking seed in paraffin proved of benefit. A common weed, *Polygonum Persicaria*, was badly riddled by the beetles.—*R. C. S. R.*

Forest Pathology in Forest Regulation. By E. P. Meinecke (*U.S.A. Dep. Agr., Bull.* 275, April 7, 1916).—It is clear that in the most important branch of forestry, silviculture, the blind adoption of European methods must cause serious difficulties. Even in Germany, many of the fundamental problems of forest organization are steadily discussed, and are far from being considered settled. European foresters have not yet developed a true system or science of silviculture capable of being applied to virgin conditions or to all conditions.
A. D. W.

Fruit Drying. By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 13–29, 95–106; 21 figs.).—To dry peaches, apricots, and nectarines whole, dip the fruit in boiling caustic soda solution (1 lb. to 8 gallons of water) for one or two seconds, spread on trays, transfer to the fumigator, where it is exposed to the fumes of burning sulphur for eight to twelve hours. Dry by sun or artificial heat, and then place in calico bags to protect from moths. If the fruit is cured in halves the immersion in caustic soda is omitted. Suitable peaches for drying are 'Elberta,' 'Early and Late Crawford,' 'Salwey' and 'Lady Palmerston.' 'Moorpark' is a good Apricot.

The best prunes are 'Prune d'Agen' and 'Robe de Sergent.' They are dipped in boiling soda solution (1 lb. to 12–20 gallons) until the skin begins to crack. This usually takes from three to ten seconds. After fumigation and drying, the prunes are placed in sweating boxes for three or four weeks, and turned over once a week. Finally, the fruit is dipped in boiling water containing a little salt and some broken prunes for five minutes. It is again dried.

Apples are peeled, cored, sliced by machinery and dropped into weak brine (2 oz. salt to a gallon). The slices are quickly placed on trays and exposed to fumigation until they acquire a nice colour (usually 15 minutes). Dry for six

to eight hours in the evaporator at 120–160° F., and put in sweat boxes for a few days. 'Dunn's Favourite,' 'Rome Beauty,' and 'Granny Smith' are suitable apples for drying. Pears are treated like apples, except that they are cut in half instead of into slices. Figs are treated like peaches. For table raisins, the fully-ripe grapes are dried in the sun; so also are Zante currants. Pudding raisins or lexias are dipped in boiling soda solution (1 lb. in 20 gallons) for three seconds before drying. Two seconds' immersion suffices in the case of sultanas. Grapes grown on a stiff soil do not make good raisins.

Sketches are given of the appliances used.—*S. E. W.*

Fruit Trees, Insects attacking Wood of. By P. Lesne (*Rev. Hort.* vol. lxxxix. pp. 300–302; 1 col. plate).—Life-size representations in colour are given of the Wood Leopard Moth (*Zeuzera pyrina*) and the Goat Moth (*Cossus ligniperda*), and their caterpillars and chrysalids: also of the beetle *Capnodia tenebris* and its larva. Enlargements are shown of *Agrilus sinuatus* and its larva, with the borings it has made in the branch of a pear tree; also the larva and adult Longicorn (*Cerambyx scopolii*), the Shot borer, male and female (*Xyleborus dispar*), and its galleries, and the Bark beetle (*Scolytus rugulosus*).—*S. E. W.*

Fruit Trees, Restoring Mutilated. By C. Arranger (*Le Jard.* vol. xxxi. pp. 131–135; 7 figs.).—In that part of France occupied by the enemy, the Germans have done their worst to ruin the orchards. The fruit trees have either been cut down at a height of three feet from the ground or a circle of bark has been removed from the tree to stop the flow of sap. In the latter case the results of this despicable outrage have been repaired by the process of bridge grafting. The grafts are arranged round the stem at a distance of two inches apart, bridging the space where the bark is removed. They are held in place by grafting-wax and strong string or wire. Crown grafting is resorted to, when the tree is cut down.—*S. E. W.*

Fruit Trees, Sun Scald of. By A. J. Mix (*U.S.A. Exp. Stn., Cornell, Bull.* 382, Oct. 1916, pp. 235–284; 2 figs., 2 plates).—Sun scald, an injury sometimes occurring to bark and outer sapwood of apple trees, is probably a winter injury, caused by freezing to death of the tissue. This freezing to death is made possible by a rapid temperature fall consequent to warming up of the tissue above freezing by the rays of the sun on a bright cold day in late winter.

Sun scald is a late winter injury as distinguished from crown rot, which is an early winter injury, and may be prevented by spraying or painting the trunk with whitewash and shading the trunk with a board. This injury is one which only occurs in certain years with a considerable intermediate period of immunity, and the prevention would be obviously employed many times unnecessarily for once when it was necessary.

A list of references to this subject is appended.—*A. B.*

Fruiting of Trees in Consecutive Seasons, The. By Spencer Pickering (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—The fruiting of a tree, over a number of years, must take place in one of three ways: the tree may produce about the same quantity of fruit in each year (consecutive fruiting), or it may produce heavy and light crops every other year (alternate fruiting), or the occurrence of heavy and light crops may be quite irregular (chance fruiting). There is a strong belief among horticulturists that a tendency to alternate fruiting exists, and to test this belief the author has kept records of a large number of apple trees and a smaller number of pear trees from 1897 to 1904 at Harpenden and from 1904 to 1913 at Ridgmont. Two methods were employed, viz. (*a*) actual weighing of the crops, (*b*) estimation of the extent to which the trees, regardless of their size, were loaded with fruit. The former method gives rise to error due to differences in size, disposition of branches, and so forth, while in the latter case there will be errors of judgment. The author concludes that there are tendencies both to alternate and to consecutive fruiting, and that conditions of soil and climate determine which of these predominates. The tendency to consecutive fruiting becomes more marked as the age of the tree increases, and is also greater in the case of trees on the crab stock.

There is no doubt, however, that for the majority of varieties external conditions, *i.e.* chance, are the main factor determining the fruiting of trees: at Ridgmont chance was potent to the extent of 90 per cent. The following table, however, does go to show that for two of the varieties studied, viz. 'Stirling Castle' and 'Bramley's Seedling,' in spite of irregularities, there is a marked

tendency to alternate fruiting. The figures are percentages of the crops given by the former in 1900 and by the latter in 1911.

	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.
Stirling Castle .	3	30	6	100	47	144	0	148	0
Bramley . .	—	—	—	—	—	—	—	35	5

	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.
Stirling Castle	144	38	95	171	264	78	47	207	0	54
Bramley .	7	20	7	103	9	100	0	103	0	15

J. E. W. E. H.

Fumigant, Para-Dichlorobenzene as an Insecticide. By A. E. Duckett (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 167, December 1915).—Para-dichlorobenzene is a colourless crystalline substance (5·1025 times as heavy as air), which volatilizes readily in normal circumstances.

It is harmless to human beings and domestic animals under ordinary conditions, but is a good specific poison for many insects.

Para-dichlorobenzene proved especially efficacious against :—

1. Stored product insects. 2. Case-bearing clothes moths. 3. Cockroaches and ants. 4. Museum pests. 5. Miscellaneous house insects, including flies, carpet beetles, book lice, mosquitos, etc. etc.—*C. P. C.*

Fusarium Blight of the Soybean. By R. O. Cromwell (*Jour. Agr. Res.* viii. March 1917, pp. 421–439 ; 1 plate, 1 fig.).—The causal organism is found to be *Fusarium tracheiphilum* Smith., and the disease is characterized by a chlorosis and shedding of leaves, and ultimately the death of the plant ensues. Cultural and morphological studies show that the organism producing the disease on the soybean is identical with the organism producing the wilt of cowpeas, and inoculation experiments show that cross inoculations can be made. Infection probably occurs through the roots, and a coarse sandy soil appears to favour the development of the fungus.

A fairly complete bibliography is given.—*A. B.*

Gas, Illuminating, The Response of Plants to. By Sarah L. Doubt (*Bot. Gaz.* vol. lxiii. No. 3, March 1917, pp. 209 ; 6 figs.).—Among the responses shown by various plants to illuminating gas were :

(1) Leaf fall. One part of illuminating gas per 1000 of air caused leaf fall in *Salvia splendens*, *Mimosa pudica*, &c.

(2) Epinastic growth of petioles. Traces of gas (50 per 1,000,000 of air) produced this effect in a number of plants investigated. [It is impossible to detect less than 1 part of gas to 400 of air by the sense of smell.]

(3) Proliferation tissue in cortex of the stem below the ground was shown by the apple, pear, ash, and elm as the result of gas escaping into the soil. (Certain bedding plants were found to be injured by the same cause : others were killed outright : others dropped their leaves or exhibited epinastic growth of petioles.

(5) Root tubercles were produced by traces of gas upon the roots of certain plants, *e.g.* the apple and pear.

The authoress makes the following practical suggestions for florists: To detect illuminating gas in a greenhouse, some vigorous plants of one of the following should be utilized : tomato, castor bean, scarlet sage, or sensitive plant. They should have from six to twelve or more leaves. These should be placed at various locations throughout the greenhouse and left from twenty-four to forty-eight hours with poor ventilation. All will respond to traces of illuminating gas within this period at ordinary temperatures.

With only a trace of gas present in the air the epinastic response will be noticeable, and the bending down of the leaves will increase with the concentration of gas present. All these plants will drop their leaves with a concentration below the limit of the odour of gas. The older leaves fall first, the younger leaves being retained until there is one part of illuminating gas to 1000 of air.—*R. J. L.*

Gerbera Jamesoni fl. pl. By C. Albert (*Le Jard.* vol. xxxi. p. 156).—A double variety of *Gerbera Jamesoni*, raised on the Riviera, is of great ornamental value. The flowers are six inches in diameter with three rows of petals. The flowers exhibit a great variety of colour—pink, salmon fawn, amber, &c. The plants thrive on a rich, well-drained soil.—*S. E. W.*

Gladiolus, Hard Rot Disease of. By L. M. Massey (*U.S.A. Exp. Stn. Cornell, Bull.* 380, Sept. 1916, pp. 150–181 ; 7 figs., 2 plates).—The disease

attacks the leaves and corm, forming brownish areas more or less circular in outline. In the leaves these areas after a period decay and sometimes drop out, giving a shot-hole appearance to the leaves.

The causal organism is *Septoria Gladioli* Passer, and produces pycnidia. It is able to survive the winter.

To control, soil disinfection is suggested, and destruction by fire of infected plants should invariably follow the discovery of the disease.

A short bibliography is given.—*A. B.*

Grafting in Victoria. By E. E. Pescott (*Jour. Agr. Vict.* Sept. 1916, p. 574).—The most useful method of re-working old trees is to cut the head right off, leaving only the stump. The old method of cleft-grafting has been superseded by the bark or crown graft. The latter method does not cause any damage to the wood, and thus with care no rotting can take place. The best method of bark-grafting is the saddle graft; the graft being inserted in the bark, and a strip of bark is carried right across the trunk and inserted in the bark on the opposite side. This method takes more time than the ordinary bark graft, but it ensures a much quicker healing over of the old stump.—*C. H. H.*

Grapes, Inheritance of Certain Characters of. By U. P. Hedrick and R. D. Anthony (*Jour. Agr. Res.* iv. pp. 315-330; July 1915).—This interim report on about 10,000 seedling grapes demonstrates certain of their unit characters. White is pure and is recessive to both black and red. No black or red variety has proved pure for colour. Self-sterile varieties usually have reflexed stamens, but breeding from upright stamens only will not eliminate, though it will decrease, the number of seedlings with reflexed stamens. Nearly 3,000 selfed varieties were grown, but they proved uniformly lacking in vigour, and were lower in quality than crossed seedlings. No definite conclusion was arrived at as to the form of the berry, but the size seems to be determined largely by the parentage, there being no indication of dominance. The season of ripening of the parent influences the season of the offspring.—*F. J. C.*

Greenhouse, Some Important Insect Pests of the. By R. D. Whitmarsh (*U.S.A. Agr. Exp. Stn., Ohio, Circ.* 154; May 1915; 10 figs.).—The Circular deals with fumigating with cyanide for white-fly, mealy-wing, and snowy-fly, spraying for red-spider and fumigating and spraying for aphids.

Minute details are given for cyanide fumigation.—*V. G. J.*

Helianthus, A New Hybrid Race of (*Jour. Soc. Nat. Hort. Fr.* vol. xvii. p. 121, Aug. 1916).—MM. Cayeux and le Clerc have produced what seems to be a most valuable strain of Helianthus—the progeny of a cross between *H. cucumerifolius* var. *purpureus* and *H. annuus* var. *gaillardioides*. The flowers show an enormous variety of colour and the plants bloom abundantly.—*M. L. H.*

Herb Industry. By Muriel E. Bland (*Irish Gard.* xii. pp. 40 and 41).—On the great possibilities of the herb industry in Ireland. Makes a strong plea for the co-operative cultivation of herbs rather than encouraging the individual to cultivate any or every herb his fancy may select. Undoubtedly herb-growing in Ireland has made a very good start, and there seems no reason why it should not become a lucrative industry after the war.—*E. T. E.*

Home Grounds, The. By E. G. Davis and R. W. Curtis (*U.S.A. Exp. Stn., Cornell, Bull.* 361, June 1915; figs.).—With a shifting and pioneer population such as that in many parts of America, it seems that there is still scope for argument and suggestions on the advantages of flower gardens and ornamental planting.

This bulletin contains both—a statement of first principles as applied to the art of landscape gardening, some diagrams showing how these principles may be applied to small holdings, and concludes with carefully classified lists of suitable trees, shrubs, roses, creepers, bulbs, annuals, shrubby and herbaceous perennials. *M. L. H.*

House-fly Control: A Maggot Trap. By R. H. Hutchison (*U.S.A. Dep. Agr., Bull.* 200, May 4, 1915, pp. 1-15; 3 plates, 4 figs.).—Describes a method of destroying the maggots of the house-fly by means of barnyard manure heaped on a wooden platform over a specially constructed concrete basin. Larvæ migrating from the manure drop into water in the basin and are drowned. The results seemed to show that at least 98 per cent. of the larvæ breeding in the manure were destroyed. Among the advantages claimed are (1) comparatively small cost, (2) small amount of time and labour required, (3) the ease with which wagons or manure-spreaders can be loaded from the platform, (4) its adaptability for use

where the production of manure is large, and (5) the fact that compactness and high moisture content, which render the trap most effective, are conditions which tend to preserve the value of the manure.—*F. G. A.*

Humogen, Experiments with. By M. F. F. Sutton (*Bull.* 8, *Messrs. Sutton, Reading*, June 1917).—A series of experiments with humogen (bacterized peat), in comparison with other manures, was started in 1917. Some adverse results are recorded, and in general the results were not in favour of humogen, which also varied in its effect according to the source from which it was obtained.—*F. J. C.*

Hybridization, Sterility as the Result of Hybridization and the Condition of Pollen in Rubus. By C. S. Hoar (*Bot. Gaz.* vol. lxii. Nov. 1916, pp. 370; with plates x.–xii.).—The author draws the following conclusions :—

1. Sterility of pollen has long been recognized as a criterion of hybridization.
2. Crosses between distinct species have long been known to be more or less sterile and to behave differently from crosses between more closely related forms or varieties.
3. True species when crosses do not, in most cases, follow the laws of Mendel, but tend rather to blend to form more or less constant types, often systematically recognized as species.
4. Many species of the Angiosperms are species in a very different sense from those of the lower plants and of the Gymnosperms in particular.
5. In some cases they are natural hybrids which have external characteristics distinct and constant enough to have specific rank from a systematic standpoint.
6. Although these species may be distinct from the systematic standpoint, yet they must be treated in a different manner from the standpoint of the evolutionist and the plant breeder.
7. Finally, the species of the genus *Rubus*, as shown from the pollen condition and also from external characters, clearly hybridize very frequently in nature, giving rise to constant forms often recognized as true species.—*R. J. L.*

Hymenanthera crassifolia. By F. G. Preston (*Irish Gard.* xii. Jan. 1917, p. 5 ; fig.).—A desirable shrub for garden purposes, but very seldom seen. Produces white berries, of dense semi-evergreen habit and 4–5 feet high.— *E. T. E.*

Injection Experiments on Plants. By Yasutaro Yindo (*Jour. Coll. Sci. Tokyo*, xxviii. pt. 6, May 1917 ; plates).—A large number of experiments on growing plants performed with the object of ascertaining the distribution and rate of conduction of substances injected into various tissues are recorded. The author found the movement of substances dependent to a great extent upon the transpiration current, and mostly in an upward direction. There was, however, some downward diffusion, and to a much slighter extent lateral diffusion. It is not clear whether downward diffusion took place mainly along the xylem or along the phloem, but it seems evident that the demand for water may cause a downward flow along the xylem vessels and away from the leaves under certain conditions. Lithium nitrate solutions were generally used, but staining solutions showed that individual bundles preserve their identity through a great part of the plant.—*F. J. C.*

Insecticide, Warm Water as. By P. Viala (*Le Jard.* vol. xxxi. p. 156).—Vines and orchard trees may be freed from pests by watering the foliage with water at a temperature of 150° F.—*S. E. W.*

Iris arizonica, spec. nov. By W. R. Dykes (*Gard. Chron.* Feb. 3, 1917, p. 45 ; with Latin diagnosis).—A distinct species allied to *I. longipetala*, raised by Mr. Dykes from seeds attached to a herbarium specimen from Arizona.—*E. A. B.*

Lace-wing Fly, Californian Green. By V. L. Wildermath (*Jour. Agr. Res.* vi. pp. 515–526 ; July 1916 ; figs.).—An account is given of the life-history and habits of the Californian lace-wing fly (*Chrysopa californica*). It is in the main similar to that of the common British species, and is found to devour between 300 and 400 aphides during its larval existence.—*F. J. C.*

Leopard-moth : a Dangerous Imported Insect Enemy of Shade Trees. By L. O. Howard and F. H. Chittenden (*U.S.A. Dep. Agr., Farm. Bull.* 708, February 14, 1916).—The leopard-moth, like so many other dangerous pests, is a European species which has been accidentally introduced into the United States in comparatively recent years. Its Old-World distribution, as recorded,

is central and southern Europe, southern Sweden, south-western Africa, Algeria, northern Morocco, and the western portion of Asia Minor.

This species was introduced into the United States some time prior to 1879; in this year a living moth was captured in a spider's web at Hoboken, N.J. In 1887 it was seen at Newark, N.J., but it was not actually recorded as occurring in this country until the following year. In 1890 the moths were observed near electric lights at Orange, N.J. In 1894 its destructive ravages were recognized in Central Park in New York City.

In its Old-World home the leopard-moth is recorded as living on a considerable number of common trees, including elm, lime or linden, ash, beech, birch, walnut, oak, chestnut, poplar, alder, and, rarely, horse-chestnut. Among orchard-trees it is reported to injure pear, apple, plum, and other fruit-trees.

In the United States it attacks all of these trees, and in addition practically all of the maples, ash, mountain-ash, tulip-tree, dogwood, aspen, and willows, and such shrubs as privet and lilac and honeysuckle. A list of eighty-three trees and shrubs which this larva has been actually observed to attack was compiled in 1894; seventy-seven of these were observed in the public parks of New York City alone. A later list contains 125 species and varieties.—*A. D. W.*

Life in Solutions of Colloidal Silica, On the supposed Origin of. By S. G. Paine (*Ann. Bot.* July 1916, vol. xxx. no. cxix.; pl.).—The author has repeated the experiments of the late Dr. Charleton Bastian, who held firmly to the view that living organisms may arise *de novo* from non-living materials. Dilute solutions of colloidal silica mixed with phosphoric acid or with some form of colloidal iron are enclosed in special tubes and undergo intermittent sterilization at 100° C., or short exposures to temperatures of 120°–130° C. During the exposure to light in an east window for periods varying from six months to two years, a small deposit collects in the base of the tubes, and this is carefully withdrawn and examined microscopically. Eighty-five tubes of colloidal silica were examined, and the amorphous deposit which collected in them was found to be composed of silica. These bodies are thought to be identical with some of the so-called fungus germs described by Dr. Bastian. It is concluded that the forms resembling organisms depicted by Dr. Bastian as evidence of spontaneous generation of life were in part purely inorganic simulacra formed by slow deposition of silica from colloidal solution, and in part depositions of silica upon dead fungal hyphae which had developed in the solutions before these were filled into the tubes and sterilized.—*G. D. L.*

Lime, Use of, on Land. By F. D. Gardener (*U.S.A. Exp. Stn. Pennsylvania, Bull.* 131, September 1914); **Ground Limestone for Acid Soils.** By J. F. Baker and R. C. Allinson (*U.S.A. Exp. Stn. New York, Bull.* 400, March 1915); **Liming the Land for Maintenance of Fertility.** By C. E. Thorne (*U.S.A. Exp. Stn. Ohio, Bull.* 279, July 1914).—All the above-mentioned bulletins deal with the same subject, and practically in the same manner. They deal exhaustively with the various kinds of lime, and give results of field tests. On the whole, ground limestone has proved itself to be quite as effective as either caustic or hydrated lime, provided an equivalent quantity is given. For practical purposes the following are suggested as equivalents: 1,000 lb. burnt or caustic lime, 1,500 lb. hydrated or slack lime, or 2,000 lb. ground limestone.—*C. P. C.*

Luculia gratissima. By J. Binter (*Le Jard.* vol. xxx. pp. 84, 85; 1 fig.).—The only satisfactory method of propagating *Luculia gratissima* is from cuttings. These are inserted in a mixture of loam (1), peat (1), and sand (4 parts), in well-drained pans with the base of the cuttings nearly touching the drainage. Cover with a bell-jar, syringe frequently, and keep in a temperature of 75° F. Give shade until the roots are formed, which requires four or five weeks, then repot. The final potting takes place in July, using a mixture of loam (2), peat (1), and one part of horse-dung or leaf-mould mixed with sand.

L. Pinceana bears flowers which are nearly white. It is less frequently seen in cultivation than the preceding.—*S. E. W.*

Maize Seed. By Wenholz (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 229–243; 9 figs.).—In selecting maize for seed, those ears should be chosen that are fully and tightly covered by the husk, as they are better protected from the attacks of the rice weevil (*Calandra oryza*). Fumigation with carbon bisulphide for twenty-four hours in an air-tight vessel with subsequent exposure to the air, is the best protection from damage by insect pests. The seed is stored in bins containing 1 lb. of naphthaline to each 40 bushels of maize.—*S. E. W.*

Moisture, Movement and Distribution of, in the Soil. By F. S. Harris and H. W. Turpin (*Jour. Agr. Res.* x. pp. 113-156, July 1917; 31 figs.).—The authors state that during recent years great differences of opinion exist as to the importance of soil capillarity of moisture and the laws governing the final distribution of moisture in the soil. As a result of several thousand moisture determinations conducted under the varying conditions of moisture, and with fallow, manure, surface mulches, crops, irrigation water, cultural methods, and seasonal conditions in the field, the authors arrived at the following conclusions: the moisture content of fallow averaged higher than that of cropped soils, but irrigation influenced the top surface of cropped plots more than the top surface of the fallow. Water did not appear to penetrate the fallow plots below 7 feet as readily as it did in the cropped plots. Wheat, maize, potatos, and peas drew the greater part of their moisture from the first 4 feet in depth.

The increase in moisture due to 5 to 7·5 inches of irrigation water was felt at depths of 10 feet in twenty-four hours, although most of the increase was in the first 4 feet. Mulches prevent the loss of water under both irrigation and dry farming to several feet of soil, though the surface foot is mostly affected.

Sand containing 7·77 per cent. of water gave up its moisture to loam more readily than did loam with 31·00 per cent. of water, or clay with 24·62 per cent. of water.

Water rose to a height of over 30 inches in a loam soil from a moist sand in ninety-four days, while from a clay soil it rose little more than 6 inches during a similar period.

A short bibliography is appended.—*A. B.*

Mutants of the Oenotheras, New Dimorphic. By Hugo De Vries (*Bot. Gaz.* vol. lxii. Oct. 1916; 5 figs.).—Besides *Oenothera scintillans*, which splits under ordinary circumstances in every generation into nearly equal groups of plants of the same type and others of the type of *O. Lamarckiana*, De Vries has cultivated pedigree families of four other mutants of *O. Lamarckiana*, which behave in the same manner. They are designated as *O. cana*, *O. pallescens*, *O. Lactuca*, and *O. liquida*. Their Lamarckiana-like offspring are constant in their progeny. Besides the two main types, they produce, as a rule, a relatively high percentage of other mutants.

The parental type is on the average reproduced in about 40 per cent. of the seedlings, the other 60 per cent. being *Lamarckiana*, with some mutants; but these figures vary considerably.

In the dimorphic mutants, the special characters are handed down to the next generation through the ovules only. The pollen lacks these characters, and is, as far as investigated, not different from that of pure *O. Lamarckiana*.

De Vries concludes that the dimorphic mutants constitute a group in which the hereditary phenomena are evidently independent of the external visible characters of the special members of the group, but that they must be assumed to have the same intrinsic causes in the different cases.—*R. J. L.*

Narcissus, Investigation of Bulb Rot of Narcissus. Part I. **The Nature of the Disease.** By E. J. Welsford (*Ann. Appl. Biol.* iv. p. 36; Sept. 1917).—Various organisms found in unhealthy bulbs were isolated and infection experiments carried out, but the disease, the symptoms of which are fully described on p. 51 of this Journal, was reproduced only by infection with the stem eelworm, *Tylenchus devastatrix*. A review of some of the literature of this pest is given, and special reference is made to Ritzema Bos's work on the Hyacinth rot, which is essentially similar to this, and which he called *la maladie annulaire*. The author recommends that weeds should not be allowed to wither on the ground which it is intended to replant with Narcissi, nor should they be dug in; Narcissi should not be planted where eelworm-infested Narcissi have grown; only healthy bulbs should be planted; bulbs that fail to grow should be dug up before they rot; bulbs with crinkly foliage should be burnt; dying foliage should be collected and burnt. *F. J. C.*

Nectar Secretion, Environmental Influences on. By Leslie A. Kenoyer (*Bot. Gaz.* vol. lxiii. No. 4, April 1917, pp. 249).—This is an account of the investigations undertaken to summarize and supplement existing knowledge of the factors which stimulate or retard the secretion of nectar. The effects of humidity, water supply, temperature, atmospheric pressure, and light are dealt with. The general conclusion arrived at was that the more favourable all conditions for growth and the more vigorous the plant, the greater is the amount of sugar secreted. Nectar is most abundant early in the blooming season, other things being equal; and accumulation and secretion of sugar is most pronounced near the time of the opening of the flower.—*R. J. L.*

Nicotine as an Insecticide.—By N. E. McIndoo (*Jour. Agr. Res.* vii. pp. 89–122, Oct. 1916; plates).—Experiments carried out by the author failed to demonstrate the entrance of nicotine into the body of insects either through the spiracles or the integuments. The fumes or odoriferous particles, however, of sprays, fumigants, and tobacco powder pass into the tracheae and are widely distributed over the insects' tissues. The nicotine kills the insect by paralysis, the trouble travelling along the ventral nerve cord from the abdomen to the brain. Exactly how the paralysis is brought about is not evident, but the author suggests that it may be by means of interference with oxygen supplies.
F. J. C.

Nicotine Sulphate and Fish-oil Soap Sprays. By L. B. Smith (*Jour. Agr. Res.* vii. pp. 389–399).—A loss of both wetting power and efficiency occurred with higher concentrations of the two sprays mentioned when used on peas, spinach, and strawberries against aphis and red-spider attacks. When more than 4 lb. soap were used with 10 oz. nicotine sulphate to 50 gallons water, or more than 8¾ oz. nicotine sulphate to 5 lb. fish-oil soap to 50 gallons of water, both wetting power and efficiency were reduced.—*F. J. C.*

Nitrogen Fixation and Nitrification, Some Factors Influencing. By B. Williams (*Bot. Gaz.* vol. lxii. Oct. 1916).—In a recent article by Lipman and Sharp it has been suggested that there are really two maxima of fixation with reference to moisture content, the one that is most favourable to aerobic bacteria, and the other at which anaerobic forms flourish best.

The first set of experiments conducted by the author showed that one at least of the free nitrogen-fixing organisms materially deteriorated through the process of drying attendant upon ten months' storage of the soil in the laboratory.

To determine to what extent drying affected the fixing power of the soils as a whole was the object of the next series of tests. It was found that the soils lost 24 to 43 per cent. of their original efficiency for fixing nitrogen during a period of fifteen months' storage.

In tests conducted with a rich garden soil known to have a vigorous *Azotobacter* flora, the nitrogen-fixing flora was found to decrease considerably under the influence of drying. After fifteen months, however, a number of soils retained considerable ability to fix nitrogen, which indicates that some species at least offer great resistance to drying. *Azotobacter* was shown to be more easily attenuated than some other species.

The nitrogen-fixing flora is so intimately connected with the humus content of a soil that this is undoubtedly the most important influence in connexion with the process. It is extremely doubtful whether a toxic condition of the soil exerts inimical effects upon soil bacteria.

In experiments conducted with lime it was found that where there is some development of the nitrifying flora in the soil originally, the effects of lime are decidedly more evident than in those soils apparently devoid of nitrifying power.
R. J. L.

Nitrogen in Fæces, The Fixation of. By E. H. Richards (*Jour. Agr. Sci.* viii. June 1917).—Both horse and bullock manure when fermented in bulk in presence of air and sufficient moisture and calcium carbonate will fix nitrogen. The fixation is brought about by *Azotobacter* and *Bacillus lactis aerogenes* working together. Fixation does not occur in manure from bullocks fed on grass: cake-feeding is essential in their case. The fixation is also reduced greatly in the case of horses fed on grass alone, the greatest fixation occurring when the horses are fed on corn and hay. This is due to the necessity for the presence of carbohydrates for the bacteria to feed on; more of them pass through the stomach of the horse undigested than through the bullock. The quantity of nitrogen added to horse manure as a result of nitrogen fixation may in the most favourable circumstances amount to as much as 50 per cent. of the original nitrogen and be complete in about a month. Nitrogen fixation would also occur in soil manured with horse dung, but the addition of nitrogen in these circumstances would be very small.—*J. E. W. E. H.*

Oenothera Lamarckiana mut. velutina. By Hugo De Vries (*Bot. Gaz.* vol. lxiii. No. 1, Jan. 1917, pp. 1–24; with a coloured plate depicting *O. Lamarckiana* mut. *velutina* (*O. blandina*) and *O. blandina* mut. *spiralis*).—The following is the substance of the author's summary of his investigations:—

O. Lamarckiana mut. *velutina* (*O. blandina*) arose from the family of *O. Lamarckiana* mut. *lata* × *semilata* among seeds of the third generation in three specimens. Of one of these a second generation was cultivated, and of one of the others four successive generations; making in all over 3,000 plants. All

of these plants, with the exception of four mutants, were exactly alike. The new mutants constituted the type *O. spiralis* (mutation coeff. 0·1 per cent. For the appearance of the original mutation only one sexual cell needs to be mutated, since in combining with a normal gamete it may give rise to *O. blandina*, as is shown by the splitting of both the reciprocal crosses of this form with *O. Lamarckiana*. The splitting goes into nearly equal groups of specimens like *O. blandina* and of *O. laeta*.

O. Lamarckiana mut. *velutina* resembles the hybrids of the type of *velutina* so much as to be considered one of them. It is slender, with long internodes in the spike, and with flowers as large as those of *O. Lamarckiana*. It differs from its parent species in that it has lost the property of producing about one-half of empty grains, and almost all of its seeds contain healthy and well-developed germs and germinate easily. This new quality is dominant over that of the parent.

Besides other differences, *O.* mut. *velutina* is distinguished from *O. Lamarckiana* in one other dominant character, the smoothness of its leaves at the time of flowering.

In crosses with those species which split *O. Lamarckiana* and some of its other derivatives into the twin hybrids *laeta* and *velutina*, the *O. velutina* produces only hybrids of the *velutina* type.

The study of this new mutant reveals at least two recessive characters in *O. Lamarckiana*, viz. the bubbles of the leaf-blade and the presence of typical empty seeds. (See also p. 228.)—*R. J. L.*

Olearia Gunniana and its Allies. By J. Hutchinson (*Gard. Chron.* Jan. 6, 13, 20, 1917, pp. 3, 13, and 33; 4 figs.).—Shows that Bentham in the Fl. Austr. included several distinct species under the name *O. stellulata*. Two of these are described as new species, viz. *canescens* and *flavescens*. Others are *lirata*, *quercifolia*, *stellulata*, *Gunniana* (with vars. *brevipes*, *phlogopappa*, *microcephala*, *angustifolia*, and *salicifolia*), *rugosa*, and *subrepanda*.—*E. A. B.*

Onion Culture. By John W. Lloyd (*U.S.A. Exp. Stn., Univ. of Illinois, Urbana, Ill., Circular* No. 173, June 1914; figs.).—Onion culture is an important industry in the State of Illinois. This circular describes how it may be most successfully carried on either by field sowing, transplanting, or by the planting of autumn-raised sets.

Hints are given for every stage of its cultivation, and advice in the choice of varieties, harvesting, and storing is added.—*M. L. H.*

Onion Fly. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1917, p. 11).—The onion fly was noted on leeks. A bed 40 by 15 feet in extent in a farm garden near Borth was totally destroyed by the larvæ, of which from three to seven were obtained in each plant attacked.—*R. C. S. R.*

Onions, Squashes, and Cabbages, To Raise. By W. T. Guptill (*U.S.A. Exp. Stn. Maine, Bull.* 2, vol. xv. June 1916).—Directions for growing, harvesting, and storing onions, squashes, and cabbages in Maine. This bulletin is meant chiefly for raisers of crops for home consumption, but it is not forgotten that they may be glad to dispose of any surplus in the local market.

The importance of good cultivation is insisted on. The writer is not afraid to say that it is more important than manuring. For green caterpillar in cabbages he recommends a heaped hoeful of dirt to be put into the centre of the cabbage. This, he says, is beneficial, and does not interfere with the hearting.—*M. L. H.*

Ophrys, Mimicry among. By H. Correvon (*Jour. Soc. Nat. Hort. Fr.* vol. xvii. Feb. and March 1916).—A note on the fertilization of some species of *Ophrys*. Unlike the orchis, this plant does not produce nectar, and as the blossoms are obviously not self-fertilized it has been a matter of conjecture what attraction they offered to insects. A careful observer of Algerian species communicates the results of his investigations, which have convinced him that the *Ophrys* is fertilized by the male *Colpa aurea*, who hatches out some days before the female, and who is actually attracted by the resemblance of the flower to the mate for whom he is waiting.—*M. L. H.*

Orange, The Navel, and other Brazilian Fruits. By P. H. Dorsett, A. D. Shamel, and W. Popenoe (*U.S.A. Dep. Agr., Bull.* 445, Feb. 10, 1917, pp. 1–35; 24 plates).—The Washington Navel Orange was introduced into the United States from Brazil forty-five years ago. Particulars are given as to its supposed origin, its history, and the method of culture in Bahia. A considerable number of other Brazilian fruits are described in detail.—*F. G. A.*

Organic Matter in the Soil, The Influence of Soil Conditions on the Decomposition of. By E. J. Russell and A. Appleyard (*Jour. Agr. Sci.* viii. June 1917).—Decomposition is brought about by bacteria and other micro-organisms. Previous observers have not been able to establish any particular connexion between the fertility of experimental plots and the number of bacteria found in their soils. But since fertility is determined by a number of factors the authors have endeavoured to determine what the essential factors are and have continued their observations over three seasons. The decompositions observed have been the amount of nitrate formation in the soil and the fluctuations of CO_2 in the soil air. When these two sets of observations, together with the bacterial numbers, are plotted for a twelve-months period the curves show that they are related: a rise in bacterial numbers is accompanied by a rise in CO_2 and, somewhat later, a rise in nitrate. Simultaneous observations of moisture and temperature were made, and it became apparent that temperature is a dominating factor. The reactions are at a standstill from November to March, but as soon as the temperature rises above 5° C. bacterial numbers and nitrate and CO_2 contents all increase. The activity soon begins to fall off, however, in spite of a favourable temperature, and the result is found to be due to another factor, viz. rainfall supplying moisture and dissolved oxygen. The curves for these three factors fit the curves for bacterial nitrate and CO_2 contents fairly well over most of the year, except for a period of depression after the spring rise and a period of autumn activity after the summer sluggishness. Comparison of curves for cropped and for fallow land show that a growing crop is a fourth and detrimental factor.—*J. E. W. E. H.*

Oxidase and Catalase in Plant Tissue, The Relation between. By G. B. Reed (*Bot. Gaz.* Nov. 1916, pp. 409; with 1 fig.).—The author describes experiments which he performed with pineapple juice, which lead him to conclude that catalase is not universally present in living cells.—*R. J. L.*

Oyster Shell Scale, and Scurfy Scale, The. By A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 723; April 1916; 3 figs.).—The author mentions that minute parasitic wasps are often efficient enemies of the oyster shell scale, and in some localities apparently hold the insect in check. If these wasps are present, small round holes can be seen on the dorsal part of the scale, showing where the adult escaped.—*V. G. J.*

Pavement Ant, The. By L. B. Smith (*U.S.A. Dep. Agr., Virginia Truck Exp. Stn., Bull.* 16; July 1915; 6 figs.).—The pavement ant (*Tetramorium cæspitum* L.) is a pest of cold-frame and greenhouse crops. In its European home the species is known as the common "meadow ant." Since its introduction to the States it has adapted itself to city conditions, making its nest beneath pavements, stone-flagging, brick walls, and cobble-stones, becoming often a serious house nuisance, and recently it has been reported as causing injury to certain house and greenhouse plants.

Fumigation with carbon bisulphide has proved the best means of control.
V. G. J.

Peach Scab and its Control. By G. W. Keitt (*U.S.A. Dep. Agr., Bur. Pl. Ind. Bull.* 395, Jan. 1917, pp. 1–66; 6 plates).—This disease causes serious spotting and cracking of the fruit, and spotting of the leaves and twigs. The causal organism is *Cladosporium carpophilum* Thüm., and it is widely distributed throughout thirty-four States east of the Rocky Mountains, as well as in Europe and South Africa. The author ranks this disease as next in economic importance to brown-rot disease.

The fungus was isolated from peach twigs, fruit, and leaves and grown upon thirty media, and it was found that the optimal temperature for growth was between 20° and 27°, and the maximal temperature about 32° C. Spores readily germinated in sterile distilled water, rain water, and in various nutrient media. Peach trees were repeatedly inoculated from the cultures and produced typical affections. The period of inoculation of the fungus upon the fruit varied from forty-two to seventy-seven days, while upon the twigs and leaves it varied from twenty-five to forty-five days.

The disease is most prevalent in temperate sections where the spring and early summer is moist and the growing season is long. The mid-season varieties and late varieties are most severely affected by the fungus.

The control measures include spraying with self-boiled lime sulphur, or finely divided sulphur, which have proved successful even in severely attacked orchards.
A. B.

Pear, A New. By Albert Barbier (*Jour. Soc. Nat. Hort. Fr.* 4th series, vol. xvii. p. 15, Jan. 1916).—A new pear, 'Arthur Chevreau,' produced by A. Chevreau of Montreuil, is pronounced to be a valuable new winter variety.—*M. L. H.*

Pear and Apple, Leaf Blister of. By A. L. Quaintance (*U.S.A. Dep. Agr. Bur. Entom., Farm. Bull.* 772; April 1916; 4 figs.).—The leaf blister mite (*Eriophyes pyri*) will yield to thorough treatment with kerosene emulsion, miscible oils, or lime-sulphur washes.—*V. G. J.*

Pear Blossoms, A Bacterial Blight of, in South Africa. By E. M. Doidge (*Jour. Appl. Biol.* iv. p. 50, Sept. 1917).—A large percentage of pear flowers in the Stellenbosch district blackened and died during 1914–15. Examination showed the presence of a bacterium which proved a new species, and which inoculated into the flowers, reproduced the disease. The name *Bacterium nectarophilum* is proposed for the organism, and careful comparisons are made between it, *Bacillus amylovorus*, and the organism which Barker and Grove isolated in England from dying pear flowers (see JOUR. R.H.S. xl. p. 621).
F. J. C.

Pear, Determination of, or Analytical Key of the Fruit.—By Gabriel Luizet (*Jour. Soc. Nat. Hort. Fr.* vol. xvii. p. 75, May 1916).—The Pomological Society of France has been interested for some years in the production of an authoritative key for the identification of individual pears.

M. Chasset, Sec. Gen. of the Pom. Soc., has been at work on such a key and has triumphantly brought it to conclusion in the intervals of his military duties since the war. It will not be published until after the war, but the MS. is already in the hands of his colleagues of the Pomological Society. His preliminary draft of the work was shown to the Society at the same time as one worked out independently by M. Jules Jouin, and the two were found to differ so little from each other that mutual concessions by the two authors were easily agreed upon, and the result was put forth at Gand in 1913 to serve as the basis of the future analytical key. M. Jouin is at present a prisoner of war in Metz, and it is not known whether he has used his enforced leisure upon this work or not, but the Society looks forward hopefully to finding that he has done so when he returns to France. In the meantime M. Chasset's method is as follows :—

Pears are first studied according to their height and width.
1st category. Equal height and width.
2nd category. Wider than high.
3rd category. Higher than wide, 1/10 to 2/10, 3/10 to 4/10.
4th category. Higher than wide, 4/10 and upwards.

The first and second categories forming vol. i. include the following forms—*spheroid, short turbiniform, short doliform, short cydoniform, maliform, flattened turbiniform.* In each of these and the following forms a figure-type of some well-known fruit determines the form to allow whoever has to determine a fruit to compare its silhouette with that of the fruit in question. The third category is included in vols. ii., iii., and iv. and part of vol. v. with the following forms: *doliform, ovoid, turbiniform, truncated turbiniform, piriform, truncated piriform, cydoniform.*

The fourth category finishes vol. v., and includes the last forms adopted—*long piriform, calabassiform, oblong.*

In each of these forms epochs of maturity have been created—June, June–July, July–July, August, &c. Each of these epochs presents a stage when the colour of the skin of the fruit is noted. The colours are dark green, light green, stained with red, ruddy or bronze. Yellow colour, which was originally admitted, was omitted at the last moment as useless for purposes of identification, as it is impossible to fix the exact shade of yellow intended. The colour must therefore be noted when the fruit is gathered, never at complete maturity when the yellow colour predominates. The peduncle is then considered in its dimensions, long or short; in its consistence, fleshy or not at the base; in its position, straight, oblique, or curved. The flesh of the fruit is examined as to colour, white, yellowish, greenish, salmon-colour; as to flavour, sugary acid, winy, musky, bitter.

For some rare fruits showing identical characters there is a column of observations where the differentiating characters are noted, whether in the tree, the twigs, or the leaves.—*M. L. H.*

Pear, Fungoid Parasite of. By L. Mangin (*Rev. Hort.* vol. lxxxviii. pp. 187–188; 2 figs.).—In the Department of the Indre and Loire, the leaves and branches of the pear trees have been attacked by a new fungus, *Oospora piricola.* The

leaves are covered with grey or white patches, and are brittle and easily broken. The under side is mealy. The presence of slender filaments is easily seen.
S. E. W.

Pear Thrips in California, Life-History and Habits of the. By S. W. Foster and P. R. Jones (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 173; April 1915; 5 plates, 14 figs.).—This minute insect, which until 1904 was unknown to science, is at present one of the most important insect pests with which growers of deciduous fruits in the San Francisco Bay region and adjoining counties have to contend, and each year the insect is developing an ability to subsist on other and new food plants. It has very few natural enemies.—*V. G. J.*

Pear Trees, To make Fertile. By V. Enfer (*Rev. Hort.* vol. lxxxix. pp. 320-321).—To render pear trees fertile it is better to bud the vigorous branches with fruit buds taken from very fertile trees, than to make use of the doubtful expedient of root pruning. This operation should be carried out in August or early September.—*S. E. W.*

Peats and Humus Soils, The Ammoniacal Nitrogen of. By J. C. B. Ellis and C. G. T. Morison (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—In view of the attention now being given to the question of the reclamation of heath and moorland the determination of ammoniacal nitrogen furnishes a figure of some importance. The authors have therefore examined a number of neutral and acid peats from Scotch and Irish deposits. Following Russell's method they distil the peat for some hours, at 40° C., under reduced pressure, with water and magnesium oxide. At the end of about two hours there is a marked drop in the amount of ammonia evolved, and the authors consider that at this stage practically all the ammoniacal nitrogen has been evolved and that more stable nitrogen-containing substances are being attacked. Large quantities of ammonia may be set free in this way, as is shown by the following: NH_3 per cent. in ordinary arable soil ·0003, in neutral peat ·005 (sixteen times as much), in acid peat ·01 (thirty-three times as much). Moreover, much of the ammoniacal nitrogen is in a highly soluble form, for one-half to three-quarters of that evolved by distilling the peat with magnesia can be removed by merely shaking the peat with water.—*J. E. W. E. H.*

Pecan Culture: with Special Reference to Propagation and Varieties. By C. A. Reed (*U.S.A. Dep. Agr., Farm. Bull.* 700, January 18, 1916).—The pecan is found only in certain parts of the United States and Mexico.

The price of nuts is an exceedingly variable factor. A short time ago these nuts were little in use except at holiday times, and the prices to the producer were such that but a small portion of the crop was actually gathered, 3 cents a pound then being considered a fair price.

The increased consumption since that time is largely due to the introduction and use of machines for cracking the nuts, and has caused a rise in price to a maximum of 25 cents a pound for the wild nuts. The average price is probably between 10 and 15 cents a pound.

With reference to the pecan, the term "papershell" has been extended in its application until it is now practically without significance. Originally applied to those types of pecans having such thin shells that one could easily be cracked when two were crushed together in the hand, the term during recent years has been made to include all cultivated varieties; many of them have as hard shells as the average wild nuts. Properly speaking, the term "papershell" never referred to a particular variety; its correct application has been only with reference to varieties having very thin shells.—*A. D. W.*

Permeability of Certain Plant Membranes to Water. By F. E. Denny (*Bot. Gaz.* vol. lxiii. No. 5, May 1917, pp. 373-397; 2 figs.).—In this paper investigations are described which were carried out to measure the rate at which water passes through known areas of certain membranes. Different species of plants and different membranes of the same species showed large differences in the rate of penetration. It was found that the seed coats of peanut and almond showed a difference in permeability to water in opposite directions through the membrane, the faster rate being from the external towards the internal portion of the seed. When solutions of varying concentrations were placed on opposite sides of the membrane, it was found that the relation between rate and concentration difference was complex, and that in general equal osmotic differences do not necessarily produce equal rates; the rate is greatly affected by changes in the concentration of the internal solution: but no mathematical

relation was noted between the concentration on opposite sides and the rate of water movement through the membrane.—*R. J. L.*

Permeability of Membranes as Related to their Composition. By F. E. Denny (*Bot. Gaz.* vol. lxiii. No. 6, June 1917, pp. 468-485; 6 figs.).—The investigations described in this paper were carried out in order to discover what substances in the membrane determine the rate at which water can pass through it. Quantitative measurements showed lipoids, tannins, and pectic substances to be factors in determining the permeability of membranes to water.

Suberized layers were not found to be significant in the membranes studied, and the presence of soluble proteins could not be detected.—*R. J. L.*

Peroxidases, The Mode of Action of Plant. By G. B. Reed (*Bot. Gaz.* vol. lxii. Sept. 1916; 2 figs.).—In a previous paper by the same author on the "Mechanism of Oxidase Action," he has shown that colloidal platinum charged at sufficiently frequent intervals with oxygen will bring about the oxidation of various substances at a rate approximating that affected by hydrogen peroxide and colloidal platinum. From this he concluded that "the action of the colloidal metal in accelerating oxidation by hydrogen peroxide (that is, its peroxidase action) is due to the taking of oxygen from the peroxide by the metal to form a compound which is a more efficient oxidizing agent than the original peroxide."

From these investigations the author has passed to an analogous investigation of the more significant and complicated problem of the nature of peroxidases produced in living tissue, as it seemed probable that the mechanism of the reactions must be similar.

As the result of experiments conducted first with the active ferment of horseradish root, and later with potato peroxidase, the processes were shown to be essentially the same. It is concluded therefore that in oxidation processes catalysed by peroxidases two reactions are involved. Firstly, the peroxidase combines with oxygen from the oxygenases (or from some other source) to form an intermediate compound which is a more energetic oxidizing agent than the original source of the oxygen; secondly, the oxidation is then affected by this intermediate compound.—*R. J. L.*

Phosphates contained in Mineral Phosphates, The Nature of. By G. S. Robertson (*Jour. Agr. Sci.* vol. viii. Part 1; Sept. 1916).—Various mineral phosphates were finely ground and extracted with 2 per cent. solution of citric acid. The ratio of the phosphoric pentoxide to the calcic oxide in the extract point to formulæ of the type $m\text{Ca}_3\text{P}_2\text{O}_8$, $n\text{CaO}$. Florida Island phosphate, for example, is represented by $m = 4$, $n = 3$. If the mineral phosphate be calcined before extraction, a citric acid soluble silica phosphate is formed, together with one or more phosphates with a lower lime content than the original phosphate.
J. E. W. E. H.

Phosphates, Manufacture of Acid. By W. H. Waggaman (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 144, December 1914).—A description of the manufacture of acid phosphate; the various processes are well described, and there are some good illustrations of the various types of machinery used.—*C. P. C.*

Phosphoric Acid and Potash: The Production and Fertilizer Value of Citric Soluble. By W. H. Waggaman (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 143, Nov. 1914).—Phosphate rock and felspar are mixed together with a small quantity of iron and manganese to assist fluidity, and heated for twenty minutes to 1400° C.; the resulting product is a fertilizing material containing both phosphate and potash. It not only shows high solubility in citric acid solutions, but is fairly good in water saturated with carbon dioxide.

Pot tests gave good results, although not so high as those obtained by the use of acid phosphate and sulphate of potash, but quite sufficient to indicate a high fertilizing value.—*C. P. C.*

Phosphorus Compounds of the Soil, The Relation between Dilute Acids and the. By E. J. Russell and J. A. Prescott (*Jour. Agr. Sci.* vol. viii. Part 1, Sept. 1916).—It was Daubeny, in 1845, who first used the terms "active" and "dormant" to distinguish soil constituents soluble in dilute acid from those not soluble. Dyer, in 1894, suggested the use of one per cent. citric acid solution to distinguish active and dormant plant food. In Sweden 2 per cent. HCl is used, in Germany a saturated solution of carbonic acid, while aspartic, acetic, and other acids have also been employed. Hall and Amos, Sigmund, and the present authors have at different times in the last ten years endeavoured to ascertain what happens exactly to phosphates contained in soil when the soil

is extracted with successive doses of dilute acid. The amounts of phosphate thus extracted when plotted show that the action is not that which would result were the soil simply a mixture of inert materials including phosphates.

Russell and Prescott in the present paper show that the action between dilute acid and the soil is in two parts, viz. a direct and a reverse action. The direct action results from absorption of P_2O_5 from the soil by the acid: the reverse action results from adsorption of P_2O_5 by the soil from the solution. The amount of P_2O_5 extracted is therefore not "available" phosphate but merely an analytical result. Different acids at equivalent concentrations have much the same direct effect: but the extent of the reverse or adsorptive action varies with different acids, being notably smaller in the case of oxalic and citric acids than with sulphuric, hydrochloric, or nitric acid. Hence the net action of citric acid is due not to greater solvent action, but to greater power of reducing adsorption. The great variations in "available" P_2O_5 as usually determined and the absence of correlation between these analytical results and the crop results are therefore due to variations in the nature of the acid and temperature and other conditions of experiment. On the same type of soil, with the same concentration of one acid and with other conditions the same, comparable results are obtained.

The reverse (adsorptive) action is eliminated by a diffusion method described in the paper.—*J. E. W. E. H.*

Phytophthora Genus, Studies of the. By J. Rosenbaum (*Jour. Agr. Res.* viii. Feb. 1917, pp. 233–276; 7 plates).—No definite criteria for the identification and separation of the various species of *Phytophthora* are known, and the author, with a view of supplying such information, obtained 11 out of the 13 species already described and studied their behaviour from pure cultures on artificial media. He found that the various species react differently on the different media, and made careful measurements of the conidia and chlamydospores, of the various types, the last named being especially useful in delimiting the species. A tentative table for the separation of the species is given, in which the genus is divided into three main groups.

A. *Cactorum Group.* Oogonia with antheridium at side: *P. Cactorum*; *P. Fagi*; *P. Syringae*; *P. Nicotianae.*

A.A. *Phaseoli Group.* Oogonia with antheridium at the base: *P. Phaseoli*; *P. Arecae*; *P. erythroseptica*; *P. parasitica*; *P. infestans.*

A.A.A. *Faberi Group.* Antheridium unknown: *P. Faberi*; *P. Jatrophae.*

Similar tables for the identification and separation of the species of such genera as *Pythium, Peronospora, Plasmopara, Sclerospora,* and *Pythiacystis* are greatly needed.—*A. B.*

Pine Lodgepole in the Rocky Mountains, Utilization and Management of. By D. T. Mason (*U.S.A. Dep. Agr., Bull.* 243, July 12, 1915).—Lodgepole pine (*Pinus contorta*) is the most important timber tree of the Rocky Mountains between Northern Colorado and Central Montana. Once considered almost worthless, it now brings $10 to $100 an acre in National Forest timber sales.

The wood of lodgepole is straight-grained, with narrow rings in which the resinous bands of summer-wood are conspicuous, though relatively small when compared with the spring-wood. It is more resinous than eastern white pine (*Pinus Strobus*), but less so than the yellow pines of south and west. It varies from almost white to light yellow or yellow-brown, with a tinge of red in the heart-wood. Its specific gravity (even dry) is about 0·38, and its weight varies from 25 to 30 lb. a cubic foot.

The wood is fairly soft—about the same as eastern white spruce (*Picea canadensis*)—and is easily worked. Though not so strong as Douglas fir of the Pacific coast (*Pseudotsuga taxifolia*), a heavier wood, tests made by the Forest Service show it to be practically as strong as western yellow pine (*Pinus ponderosa*), and stronger than Engelmann spruce (*Picea Engelmanni*) and Alpine fir (*Abies lasiocarpa*), three woods of more nearly its weight.

Tests made on lodgepole pine and western red cedar (*Thuja plicata*)—telephone poles cut green and seasoned—showed lodgepole pine to be the stronger, both in cross-bending and in compression parallel and perpendicular to the grain. The strength of fire-killed lodgepole pine poles was found to be approximately the same as that of red cedar poles cut green and seasoned.

Lodgepole pine is not durable in contact with the soil, but is easy to treat with preservatives.—*A. D. W.*

Pine Moth, The Zimmermann. By J. Brunner (*U.S.A. Dep. Agr., Bull.* 295, October 28, 1916).—This moth (*Pinipestis zimmermanni*) is very destructive to conifers, and especially to *Pinus ponderosa* in various sections of the west, and *P.*

Strobus, *P. resinosa*, *P. austriaca*, *P. sylvestris*, *P. Cembra*, and other pines in the east. Aside from being largely the cause of "spike-top" in mature timber it kills outright innumerable trees of the so-called "second growth." The timber of at least one area, thus far discovered, has been brought into such ill-repute that carpenters and builders refuse to use it for anything in which "never-ending shrinkage" is objectionable.

The length of the moth is about one half-inch. The general colour varies from light grey to reddish grey, and the body of specimens having the latter hue on head and thorax is usually dark grey. The underside is uniform grey colour.

The moth attacks mature trees from between 10 to 30 feet from the top down, and second growth from about breast-high up to 35 to 40 feet. Infestation nearer the top or base occurs only to a very limited extent.

In dealing with the pest it is necessary to remove:

(1) Those trees which, below the spike, show branches with yellow needles (a certain indication of present infestation).

(2) Those which are struck by lightning and remain green, as the moth usually breeds in great numbers along the lightning scars; and,

(3) Those which display knobby growths on branches, they being in many localities the most prolific source of replenishment of the moth.—*A. D. W.*

Pinus ponderosa, Western Red-Rot in. By W. H. Long (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 490, Jan. 1917, pp. 1–8).—The author finds a varying percentage of western yellow pines (*Pinus ponderosa*) affected by a serious heart-rot in Arizona and New Mexico. This disease has three stages—(1) An initial stage, where the heart-wood is firm but shows reddish discolorations; (2) an intermediate stage, where the diseased heart-wood is white and delignified; (3) a final stage, where the heart-wood has disappeared.

The fungus, however, attacks both sap and heart-wood of dead branches, from which it travels down into the heart-wood of the living tree. Although it resembles the red-heart disease (*Trametes Pini*), the author considers it to be a different fungus, with fruiting bodies resembling *Polyporus Ellisianus*.—*A. B.*

Plantations at Corrour, Sir John Stirling-Maxwell's. By H. J. Elwes (*Quart. Jour. of Forestry*, x. pp. 123–128; April 1916).—The Loch Ossian plantations, which extend to 600–700 acres, were intended to improve the landscape and to afford shelter for deer, and were begun twenty-two years ago. They all lie above 1,250 feet, and extend to 1,670 feet around the shores of Loch Ossian, a lonely loch east of the Corrour siding on the West Highland Railway, which skirts the west side of the great Moor of Rannoch. They are fully exposed to the severe gales from the west, but are better sheltered on the north and south by mountains.

The soil is in most places a gravelly glacial drift overlaid by deep peat, with some loamy soil in patches, but little, if any, of it would be considered fit for pasture; and the growth of the trees first planted on the peat was very slow until drains were cut, and the trees planted on the reversed turves taken out of them. Since this has been done a great improvement has taken place, and the younger plantations seem generally more promising than the older ones.

Sir John Maxwell says that *Pinus Cembra*, always rather a slow grower, grows as fast in a poor gravel at 1,400 feet as it does in a lowland garden.

Another pine which has been largely planted at Corrour is the erect Pyrenean variety of *Pinus montana*, of which the seed was specially collected at Mont Louis, and which was expected to produce much better timber than the ordinary Swiss form.

The locality seems too high for the Japanese larch, which seldom ripens its leading shoot: but a few specimens of *Larix occidentalis* were growing very well considering the conditions, better than in Sir Herbert Maxwell's lowland plantations in Wigtownshire.

Several species of spruce have been tried, of which, as far as I could judge, the white American spruce, *Picea alba*, was the most promising. The plants showed a more regular growth with fewer failures than any other tree at Corrour and were quite unhurt by spring frosts in places where the Common and Sitka spruce had suffered severely. Though a tree of the latter has attained 34 feet in height in twenty years, it does not look as though it would become a real timber tree, except in situations where the soil is deep, moist, and good enough to enable it to be closely crowded. The plantation at Durris, which is perhaps the best example in Great Britain of this species, is in close order. *Picea ajanensis*, *P. orientalis*, and *P. nigra*, planted twenty years, have attained 14 to 16 feet in height, but do not look very happy; *P. Omorika* seems so far to grow well,

though the soil and climate are very unlike those of its native country. *Abies nobilis* is quite unhurt by the severest frost, and it is never injured by the heaviest snowfall; but it will never attain much size, though it grows better in the Highlands up to about 1,000 feet than it does in the south at low elevations.—*A. D. W.*

Plant Pathology, Problems of. By F. L. Stevens (*Bot. Gaz.* vol. lxiii. No. 4, April 1917, pp. 297).—The author gives a survey of modern pathological work, and points out the need for a classification of plant diseases which should emphasize the relationships of conditions which it is of service to know. The following suggestions towards such a classification are made:—

I. The parasite living in the sap or in cavities or parts devoid of living protoplasm:

(*a*) Wilt diseases due to mechanical stoppage of vascular bundles by parasites, e.g. *B. solanacearum.*

(*b*) Diseases caused by disintegration of xylem structures, e.g. various wood rots, *Hydnum, Fomes,* &c.

II. The parasite for the most part of its life drawing its nutriment from host cells that are still living:

(*a*) Endocellular parasites—the strictest type of parasitism, e.g. *Synchytrium.*

(*b*) Diseases due to parasites which draw their nutriment from living cells by haustoria (endocellular haustorial parasitism), e.g. *Peronospora, Cystopus.*

(*c*) Diseases affecting only live epidermal cells (epidermitis), e.g. *Erysiphales.*

(*d*) Diseases in which the parasite grows between the living host-cells; absorption is by the intercellular mycelium (intercellular mycosis), e.g. rusts.

(*e*) Diseases in which the host tissue is displaced or replaced by fungous masses (mycosclerosis), e.g. *Claviceps* and the smuts.

(*f*) The tumor-like diseases, e.g. *Pseudomonas tumefaciens.*

III. The parasite living within host-cells or tissues which have recently been killed or partly disorganized by it:

(*a*) Diseases in which the dominant feature is death of the host-cells before they are actually invaded by the parasite (necrosis). According to the part involved we may recognize:

(i) Cortical necrosis, in which the cortex chiefly is involved, e.g. *Sphaeropsis.*
(ii) Parenchymal necrosis, in which the parenchyma, including the greater number of the soft rots, is affected, e.g. *Rhizopus, Penicillium.*
(iii) Macular necrosis, in which necrosis is limited to spots chiefly occurring on leaves. Of this there are two types, according to whether there is abscission or not. Examples of the former are *Cylindrosporium* and *Marssonia*; if the latter, *Pseudopeziza* and *Septoria.*—*R. J. L.*

Plant Peroxidases, The Supposed Action of Potassium Permanganate with. By H. B. Bunzell and H. Hasselbring (*Bot. Gaz.* vol. lxiii. No. 3, March 1917, pp. 225–228).—In the *Bot. Gaz.* vol. lxii. pp. 233–238, Reed describes experiments which he carried out, which led him to conclude that in oxidation processes catalyzed by peroxidases two reactions are involved: first, a combination of the peroxidase with oxygen from substances acting as oxygenases; and second, a transfer of this oxygen to the substance oxidized by means of peroxidases. In this way he believes that the mechanism of oxidation in living tissues could be accounted for. As the result of the investigations of the present writer it seems that in the reduction of potassium permanganate by organic substances in neutral solutions hydrated peroxides of manganese are formed, which are held in solution and which, though they are reductive products of permanganic acid, are still capable of carrying out oxidations. It appears extremely probable that the oxidation phenomena observed by Reed were brought about by such peroxides of manganese and not by activated plant peroxidases. Moreover, since a number of substances acting on potassium permanganate give mixtures which oxidize other compounds, there is no evidence in Reed's experiments that the reduction of the potassium permanganate was brought about by plant peroxidases.—*R. J. L.*

Plants and the Winter. Anon. (*Irish Gard.* xii. pp. 136–141, Sept. 1917).—Very interesting reports containing lists of plants which were killed, injured, or remained uninjured after the severe winter of 1916.—*E. T. E.*

Polyporus Schweinitzii. By J. M. Murray (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 56–57, January 1916).—This fungus has been known on the Continent for many years as an enemy of Scots pine, Weymouth pine, and larch, but has not been considered a serious enemy. In the United States it is common through-

out the northern forests of spruce and fir, and is said to be one of the most destructive of Polypori. There, it is recorded as attacking the white and red spruces, Balsam firs, Thuias, and Weymouth pine. In Britain *P. Schweinitzii* has hitherto been regarded as a rare species. It seems to be becoming much more common, however, and may yet have to be regarded as a great danger to coniferous forests. It attacks Douglas fir and Sitka spruce in Perthshire, and Scots pine in Midlothian, as well as larch in England.

Evidently the fungus first attacks the roots and then gradually works upwards into the trunk. There it spreads, causing decay in the stem up to a height of 40 to 50 feet.

The rate at which the fungus progresses seems to be variable. About six years ago a large Sitka spruce first produces sporophores at a few feet from the base of the trunk. To outward appearance the tree remained healthy till it was broken over by wind two years ago. The outer wood, to about 6 to 8 inches in width, was then found to be the only sound part in a butt 3 feet in diameter at breast-height. About 18 feet of the stem showed more or less distinct rings of rot.

The following remedial and preventive measures might be suggested:

(1) Cut off affected roots well above the place where the last sign of rot appears, and tar the wound.

(2) Collect and burn sporophores while young.

(3) Cut out badly attacked trees and plant hard woods in their places.

A. D. W.

Potassium Cyanide and Ether, Similarity in the Effects of. By W. J. V. Osterhout (*Bot. Gaz.* vol. lxiii. No. 1, Jan. 1917, pp. 77–80; with 1 fig.).—In common with such typical anaesthetics as ether and chloroform, potassium cyanide produces a temporary decrease in permeability. The author suggests that this does not show that anaesthesia is a form of asphyxiation, but that it is more probable that the effect produced by KCN is the result of its inhibiting effect on oxidation.—*R. J. L.*

Potato Scab and Sulphur Disinfection. By C. D. Sherbakoff (*U.S.A. Dep. Agr., Cornell, Bull.* 350, Aug. 1914, pp. 709–743; 2 figs.).—Potato scab is widely distributed, and is characterized by roughened spots which may form deep pits in the outer skin of the tubers. The disease is due to the fungus *Actinomyces scabies* (Thaxter) Güssow.

From the experiments, the author finds that if 450 to 900 lb. of flowers of sulphur to the acre are broadcast on land, scab is considerably reduced.

If, however, lime and sulphur are added together in equal proportions the fungicidal power is reduced to nil, but if 400 lb. of lime are mixed with 900 lb. of sulphur to the acre and placed on land, the fungicidal power is not diminished and the crop is considerably improved. It is noticed that sulphur added to the fertilizer reduces its value.—*A. B.*

Potato Seed for Northern Nebraska. By R. A. Emerson (*U.S.A. Exp. Sta. Nebraska, Bull.* 146, Dec. 1914).—It is suggested that the ideal potato for any district or set of conditions is probably best produced in that district or under those conditions. In East and South Nebraska, however, it has been found that the stock deteriorates so rapidly that fresh seed has to be imported every two or three years, and any long series of breeding operations has been impossible. The Nebraska Experiment Station, however, does not consider this state of things inevitable. Two methods of managing a crop—by frequent surface tillage in the usual way and by treating with a mulch—were tried, and an elaborate series of tests and cross-tests clearly brought out that the mulching system was most suited to that region. It is hoped in time to produce a strain of potato hardy enough for the severe Nebraska conditions by this method.

The mulch should be about four inches deep after settling, and may consist of hay, straw, stable litter, or other coarse material free from grain and noxious weed seeds.

It must be remembered that these experiments were designed, not to test the effect on the growing crop, but to discover the best method of producing a good strain of seed.

Each experiment, therefore, took two years to complete.—*M. L. H.*

Potato, Spongospora subterranea and Phoma tuberosa on, the Irish. By L. E. Melhus, J. Rosenbaum, and E. S. Schultz (*U.S.A. Jour. Agr. Res.* vol. vii.

No. 5, Oct. 1916, pp. 213–254; 1 fig., 11 plates).—The following summary of this work is given :—

1. *Spongospora subterranea* exists in six different potato-growing districts in the United States.

2. Periods of damp, rainy, and cloudy weather favour the development of the fungus. Infection develops earlier on roots than on the tubers.

3. The authors consider that cultural practices and soil water are important agents in spreading the disease.

4. The fungus attacks seven other solanaceous hosts, including the tomato, besides the potato. The disease forms large galls on the roots of such hosts, and these galls have many points in common with the *Plasmodiophora Brassiceae* on the cabbage.

5. The absence of the canker stage may be due to the short growing period afforded the potato crop in the infected districts of the United States.

6. Amongst the saprophytic fungi found associated with *S. subterranea* is a species of *Papulospora*, which may be easily confused with the first fungus because of similarity in shape of spore balls.

7. There is a close relation between certain soil types and the development of the fungus. From the type of soil and its drainage, it is possible to predict what the development of the disease will be in any particular field.

8. The dry-rot due to *Phoma* is the most serious of the rots. The species described is given the name of *Phoma tuberosa*, n. sp.

A short bibliography is appended.—*A. B.*

Potato, Tuber-Rot and Wilt of. A Physiological Study of Two Strains of Fusarium in their Causal Relation to Tuber Rot and Wilt of Potato. By George K. K. Link (*Bot. Gaz.* vol. lxii. Sept. 1916; 13 figs.).—As the result of his investigations the author concludes :

1. That both *Fusarium oxysporum* and *F. trichothecioides* (*F. tuberivorum* of Wilcox and Link) can produce both tuber rot and wilt of the potato plant.

2. The wilt is induced by destruction of the root system and by clogging of the wood-vessels of the stem, and is, in mild cases, marked by such symptoms as discoloration of leaves, curling and rolling of leaves, and production of aerial tubers.

3. Under field and storage conditions *F. oxysporum* is more probably responsible for wilt than is *F. trichothecioides*, and the latter more responsible for tuber rotting.

4. The optimum and maximum temperatures of *F. oxysporum* are higher than those of *F. trichothecioides*. The former has a more rapid, superficial, and spreading habit of growth than the latter.

5. Both organisms possess a striking ability to use the most diverse carbon material as carbon sources in their metabolism.—*R. J. L.*

Potato, Weight of Seed per Acre. By J. T. Ramsay (*Jour. Agr. Vict.* Oct. 1917, p. 592).—For general practice the Department of Agriculture recommends 27 inches between the rows, about 15 inches between the sets, with sets of an average weight of 2 oz. Approximately 17 cwt. of seed are required for an acre. Experience shows that fairly heavy seeding and liberal manuring is sound business policy.—*C. H. H.*

Potatos, Some Degenerate Strains of. By F. C. Stewart (*U.S.A. Exp. Stn., New York, Bull.* 422, July 1916, pp. 318–357; 12 plates).—The conclusions reached were that leaf-roll, curly-dwarf, and mosaic are closely related disorders, due to the same general undetermined cause. All are transmitted through the seed tubers, so that the progeny are similarly affected.

There is no evidence that any of the above forms of degeneration are communicable from one plant to another, except through the seed tubers. They are not due to any parasitic organism, nor can unfavourable soil or weather conditions be responsible.

Neither normal foliage nor high yield is a guarantee of productivity in progeny the following season. Degeneration may occur quite suddenly. It is unsafe to select seed potatos from fields containing many degenerate plants. Even the normal plants from such fields may produce worthless progeny. It is doubtful if any method of seed selection will prevent the "running out" of seed potatos under certain conditions.—*A. B.*

Primula sinopurpurea. By B. (*Irish Gard.* xii. June 1917, p. 88).—A useful but brief description of a desirable new species.—*E. T. E.*

Prunus Pseudo-cerasus. By R. I. Lynch (*Gard. Chron.* Aug. 4, 1917, p. 47; with 4 figs.).—A critical note on apparently the only tree of this species in cultivation in Britain. Reference is made to Lindley's type specimens in the Cambridge Herbarium in comparison with *P. serrulata*.—*E. A. B.*

Puccinia graminis, Biological Forms of. By E. C. Stakman and F. J. Piemeisel (*Jour. Agr. Res.* x. pp. 429–495, Aug. 1917; 7 plates).—*Puccinia graminis* has been found upon thirty-five species of grasses in various parts of the United States. The authors have isolated the following biological forms from thirty grasses: *Puccinia graminis tritici*, *P. graminis tritici compacti*, *P. graminis secalis*, *P. graminis avenae*, *P. graminis phleipratensis*, *P. graminis agrostis*. More than one biological form may occur on the same host in nature, sometimes even on the same plant. On the basis of parasitism the biological forms may be divided into two groups, the first three forming group I.; the other three, group II.

The differential hosts for group I. are wheat, club wheat, rye, and *Agropyron repens*, while the differential hosts for group II. are oat, *Phleum pratense*, and *Agrostis* spp.

Barley, rye, and *Bromus tectorum* have been infected by all six biological forms. These forms may be distinguished morphologically as well as parasitically. The size, shape, and colour of the uredospores are the distinguishing characters. The rate of development of a given biological form depends upon the vigour of the rust strain, the kind and the age of the host plant, as well as external conditions of light, heat, and moisture. Sunlight, high relative humidity and moderate temperatures up to about 75° F. are most favourable to rust development.

A short bibliography is appended.—*A. B.*

Pueraria Thunbergiana. (*Le Jard.* vol. xxxi. p. 140; 1 fig.)—*Pueraria Thunbergiana*, the Kuzu or Kuza of Japan is a hardy and vigorous climber with handsome foliage and enormous tubers. It is valuable as forage, as a source of textile fibre and also of flour from its tubers.—*S. E. W.*

Quassin as a Contact Insecticide. By W. B. Parker (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 165, December 1914).—It has been supposed by many horticulturists that quassia owes its effectiveness as an aphicide entirely to the extreme bitterness it imparts to the sprayed plants, making them thereby distasteful to the pests. This undoubtedly plays a great part in its effectiveness, but the author has amply proved that Quassin, the active principle of quassia chips is a powerful insecticide itself, even when compared with nicotine sulphate.

Methods of extraction are given, also experimental results in the field.
C. P. C.

Radioactive Substances as Fertilizers, Use of. By W. H. Ross (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 149, December 1914).—The results given in the above bulletin do not encourage the use of radioactive substances for general farm use. In fact, there is evidence given to prove that the increases shown in some cases are due to the uranium contents, as the amount of radioactive substances in experimental fertilizer was actually less than that present in normal soils.

It is thought, however, that when properly carried out, in greenhouse or other work where the great expense is justified, beneficial results may be obtained by the use of radioactive substances.

It is found that nitrogen-fixing bacteria (*Azotobacter chroococcum*) were strongly stimulated in gelatine cultures, by passing air containing radium emanations over them.

Under like conditions the period for the germination of seeds was shortened, and an increase of development in plant growth shown when watered by radioactive water.—*C. P. C.*

Rainwater, Dissolved Oxygen in. By E. H. Richards (*Jour. Agr. Sci.* viii. June 1917).—The amount of oxygen carried into the soil as gas dissolved in rainwater is of considerable interest, since oxygen is essential for root aeration, and the oxygen dissolved in rainwater is also one of the chief factors controlling the activity of soil bacteria. The author has made a large number of analyses of rainwater by Winkler's method, and finds that it is very nearly saturated with oxygen when the temperature of collection is below 5° C., as is the case for about nine months in the year in this country. For temperatures above 5° C. the dissolved oxygen may fall as much as 25 per cent. below the saturation point.
J. E. W. E. H.

Raisin Industry, The. By George C. Husmann (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 349, Washington, March 1916; figs.).—An account of the origin and growth and of the present condition of the raisin-growing industry in California. The first introduction of raisin grapes into California was in 1851. The industry has fluctuated in importance and profitableness, but is firmly established, and California now produces three times as many raisins as Spain. The requirements of the home market are already supplied, and if the demand became greater it would be quite easy enormously to increase the production. The bulletin describes the methods of culture and of drying, and gives exact descriptions of the varieties grown. So far the currant grape has only been planted in small quantities, but efforts are being made to encourage this branch of the industry also.—*M. L. H.*

Rhododendron sphaeranthum (*Irish Gard.* xii. p. 133, Sept. 1917).—A new and interesting Chinese shrub collected by George Forrest in the mountains west of the Fengken Valley, in June 1914, at an altitude of twelve to thirteen thousand feet.—*E. T. E.*

Ringing, Effect of, on Movement of Sugar, &c. By Shin-ichi Hibino (*Jour. Coll. Sci. Tokyo*, xxxix. pt. 5, March 1917; plates).—Unfortunately in German, this well-illustrated article is of considerable horticultural value. Leaves on portions of stems ringed by removal of bark showed abnormal development of anthocyanin both above and below the ringing, and other differences in rate of development and size of leaves were noted. Careful comparisons of the extent of development of callus and so on, as well as rate of thickening above and below the ring, and quantity of reserve material in stem and leaf above and below are also made.—*F. J. C.*

Rosa, Imperfection of Pollen and Mutability in the Genus. By Ruth D. Cole (*Bot. Gaz.* vol. lxiii. No. 2, Feb. 1917; pp. 110).—The examination of a large number of species of *Rosa* has shown a great amount of abortive pollen, and also great variability in the genus. Both of these factors point to the species as being largely of hybrid origin. The writer concludes that "the mutability of the species of *Rosa* cannot properly be used in support of the mutation hypothesis, since this phenomenon is obviously the result of hybrid contamination in nature."—*R. J. L.*

Rose, Bacterial Disease of. By E. E. Pescott (*Jour. Agr. Vict.* Dec. 1916, p. 707).—In the case of a new disease in roses, in which the young shoots and leaves shrivel, turn black, and die, followed by death of main shoot, and lastly the whole plants, it is found that painting the stems of affected plants with permanganate of potash (half ounce to gallon water) has resulted in good recovery. Three or four applications are necessary at intervals of about a fortnight; avoid letting the solution drop on the foliage more than is unavoidable.—*C. H. H.*

Rose Chafer, The, a Destructive Garden and Greenhouse Pest. By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 721; April 1916; 4 figs.). —The rose and grape vine are the greatest sufferers from attacks by this insect; but it is also very destructive to fruit, shade, and other trees and shrubs. In times of great abundance these insects completely destroy flowers, peas, beans, and nearly all garden fruits and vegetables, corn, wheat, and grasses. They consume alike blossoms, leaves, and fruit.

It is one of the most difficult insects to control successfully, and a thoroughly effective remedy has yet to be discovered.—*V. G. J.*

San Jose Scale, Observations and Experiments on the. By Stephen A. Forbes (*U.S.A. Exp. Stn., Ill., Bull.* 180; March 1915; 3 figs.).—Experiments with infested ripe apples show that the San Jose scale may live and reproduce freely on such fruits plucked from the tree and kept at ordinary room temperatures, and that living young may continue to be born under such conditions during a period of eight weeks. Infested apples taken from cold storage in December gave similar results, young being produced on these apples for twenty-five days.—*V. G. J.*

Scots Pine, Some Observations on the Entomology of the. By J. W. Munro (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 114-122; July 1916).—Of all our Scottish timber trees the Scots pine probably supports the largest number of insects. This is not surprising when we consider that it has been for long the chief timber tree. It is, moreover, an indigenous species. Of the Coleoptera it

supports twenty species belonging to eleven genera. Many of these beetles are to be found only on the Scots pine, and others of them prefer it to their other hosts, such as spruce.—*A. D. W.*

Seed Production of Western White Pine. By Raphael Zon (*U.S.A. Dep. Agr. Bull.* 210, April 17, 1915).—The age of the trees evidently has an effect upon the amount and quality of seed produced. Thus the younger trees, ranging from 72 to 100 years of age, have produced a larger quantity of germinable seed than the older trees.

The relation between the length of the cone and the size of the seed (the number of seeds in a pound) is clearly shown. Thus the longest cones, 8 inches and over, yielded about 22,000 seeds to the pound, while cones 5 inches long occasionally yielded as many as 57,000 seeds to the pound.

The vigour of growth apparently influences favourably the amount and quality of seed produced.

While a relation between the size of the seed and its germinative vigour is not clearly brought out, yet there seems to be a tendency for the larger seeds to have the highest germinative vigour.—*A. D. W.*

Seeds, Temperature and Life Duration of. By James F. Groves (*Bot. Gaz.* vol. lxiii. No. 3, March 1917, pp. 169–187).—The investigations described were carried out with the idea of seeking to determine "the extent to which a study of the laws of the life duration of seeds at high temperatures (50°–100° C.) will explain the process of degeneration of air-dried seeds at ordinary storage temperatures." The experimental results obtained makes possible a quantitative statement of the significance of various storage conditions, especially moisture content and temperature upon the longevity of seeds.—*R. J. L.*

Shortleaf Pine: Its Economic Importance and Forest Management. By W. R. Mattoon (*U.S.A. Dep. Agr., Bull.* 308, November 22, 1916).—Shortleaf pine is admirably adapted to pure plantations, which are strongly recommended over any kind of mixture in starting young forest stands. Shortleaf may, however, be planted in mixture with heavier-foliaged species of slower growth—for example, sugar maple and such durable and valuable wood as red juniper. The red pine and western yellow pine are not successful in mixture with shortleaf because of the attacks of *Aecidium Pini*, a rust fungus. Pure plantations of shortleaf promise larger financial returns than any other form. Mixed stands afford better protection against large losses from disease and insect ravages, as well as a variety of wood for use on the farm and to supply markets which may offer better returns for such sales.—*A. D. W.*

Soil Bacteria, Influence of Barnyard Manure on. By J. E. Greaves and E. G. Carter (*Jour. Agr. Res.* vi. pp. 889–926; Sept. 1916).—The authors found that the quantity of manure, and of water, and the cropping influenced the bacterial content of the soil. In the particular calcareous soil experimented with, the application of five to fifteen tons of manure increased both the ammonifying and the nitrifying powers of the soil, as did the application of thirty inches of irrigation water. Forty inches of water, however, reduced the ammonifying powers. A direct relationship was found between the number of bacteria, the ammonifying and nitrifying power, and the crop production on soil receiving no manure, five tons, and fifteen tons an acre, while the bacterial activities of soil receiving varying amounts of water were closely correlated with the crop produced. The ammonifying and nitrifying powers of fallow soils were slightly higher than those of cropped soils.—*F. J. C.*

Soil Bacteria, The Influence of Crop, Season, and Water on. By J. E. Greaves, R. Stewart, and C. T. Hirst (*Jour. Agr. Res.* ix. May 1917, pp. 293–341).—It is of the utmost importance that the quality and quantity of plant food rendered available during the season should balance that required by the growing plant, so that the maximum yield may be obtained with the minimum loss of soil fertility. Most of the changes which take place in the soil are due to bacteria, and the speed with which these changes occur is governed, amongst other factors, by the season of the year, the crop, and the water in the soil.

The authors, after reviewing concisely the previous work done by other investigators on the influence of moisture, the influence of the crop, and the influence of the season, and after numerous experiments, arrived at the following conclusions:—

The quantity of nitric nitrogen in the surface 6 feet of alfalfa soil is low throughout the season, but higher in the autumn than in the spring or summer

the amount decreases as the water increases. The quantity of nitric nitrogen in the surface 6 ft. of potato, oats, corn, and fallow soil decreases as the water increases; but the quantity formed for each is greatest where the largest quantity of water was applied. Large quantities of nitric nitrogen disappear from fallow soil during the summer months, due to bacteria growth which converts it into protein substances, and not to denitrification. The use of irrigation water increases the bacterial activities of the soil, which render soluble the nitrogen, and where excessive amounts of water are used this soluble nitrogen is lost.

A fairly complete bibliography is appended.—*A. B.*

Soil, Effect of Decomposing Organic Matter on the Solubility of certain Inorganic Constituents of the. By Chas. A. Jensen (*Jour. Agr. Res.* vol. ix. No. 8, May 1917, pp. 253–268).—In Southern California many Citrus groves are largely mulched by stable manure, hay, clover, and alfalfa. These substances soon begin to decompose when exposed to rain, and their decomposition products leach into the soil. On certain soils much benefit follows such mulching, especially from the clover and alfalfa straws. It was found that the solubility of calcium, magnesium, iron, and phosphoric acid in Citrus soils was measurably increased by green manure, stable manure, and their extracts, and this was held to be due partly to the action of the inorganic salts contained in the organic substances and partly to the solvent action of the soluble organic compounds formed during decomposition.—*A. B.*

Soil, Factors affecting the Evaporation of Moisture from. By F. S. Harris and J. S. Robinson (*Jour. Agr. Res.* vii. pp. 439–461, Dec. 1916).—The authors investigated some of the factors promoting evaporation from soils, and found the rate of evaporation from a moist soil to be very rapidly decreased as the humidity of the air increased; air currents up to a certain velocity increase the rate of evaporation; evaporation is higher from finer than from coarser saturated soils; reduction of intensity of sunshine greatly reduces rate of evaporation (but it is not clear whether temperature is taken into account); slight changes in temperature have a marked effect on evaporation; a thin dry mulch, especially if composed of coarse particles, which are more effective than fine, materially reduces evaporation; compacting the surface increases evaporation, and high concentrations of dissolved salts reduce it.—*F. J. C.*

Soil, Measurement of Inactive Moisture in, by the Dilatometer. By George Bouyoucos (*Jour. Agr. Res.* viii. Feb. 1917, pp. 195–217; 1 fig.).—The principle of the dilatometer is based upon the fact that water expands when freezing. If the amount of expansion that a given quantity of water produces upon freezing is known, the total amount of water that freezes in a soil can be calculated. The dilatometer consists of a bulb, a thermometer, and a measuring stem. The method consists of mixing soil and water in certain definite proportions in the bulb and then filling with ligroin. The apparatus is cooled, and the total rise of the ligroin in the stem is taken to represent the total quantity of water that freezes in the soil.—*A. B.*

Soil Nitrates, Effects of Water and Manures on. By F. S. Harris and N. L. Butt (*Jour. Agri. Res.* viii. Feb. 1917, pp. 333–359; 18 figs.).—The authors find that with a sod soil kept in the laboratory for two and a half years, the total salts and nitrates accumulated most rapidly with a moisture content of 23 per cent. to 25 per cent. Cropped and uncropped soil kept in large tanks under controlled moisture conditions showed a decrease in nitrates and total soluble salts as the percentage of moisture increased, the nitrates being very low in water-logged soil. Under field conditions more nitrates were found in both cropped and uncropped (fallow) soils during the summer than just after the corn crop had been harvested. Large irrigations decreased the soluble salts in cropped soils more rapidly that it did in fallow soils; and irrigation or manuring affected the nitrates relatively more than the total salts. It was also found that in unmanured soil the nitrate content was about twice as great with a fallow as with a crop, and in manured soil it was about three times as great. The ratio of total soluble salts to sodium nitrate in a cropped soil was 24·5 to 1 without irrigation; and 37·5 to 1 with 40 inches of water, while in a fallow soil the ratio was 8·9 to 1 without irrigation and 16·2 to 1 with 40 inches of water.

A short bibliography is appended.—*A. B.*

Soil Nitrogen and Nutrition of Citrus Plants. By J. G. McBeth (*Jour. Agr. Res.* ix. May 1917, pp. 183–252; 18 figs.).—The total nitrogen content of Citrus lands is often low and this deficiency must be made good by fertilizers,

manures, &c. The author finds that semi-arid soils frequently fail to nitrify dried blood when added in 1 per cent. amounts, but can nitrify blood if added in amounts not greater than is ordinarily applied under field conditions. Green manures, especially the legumes, nitrify very rapidly. Fifty per cent. of the nitrogen contained in green plant tissues may be converted into nitrates in thirty days, while, of course, such manures furnish a valuable source of energy for the non-symbiotic nitrogen-fixing organisms. As much nitric nitrogen is lost from Citrus soils by leaching, the growing of a winter cover crop is suggested as a most effective means of preventing this loss. The prevalent system of furrow irrigation causes a very unequal distribution of the soil nitrates, forming brown "nitre" spots, which sometimes contain 1 per cent. N as nitrates. These "nitre" spots consist largely of the deliquescent calcium nitrate. The author holds that basin or overhead irrigation is more satisfactory in promoting the more equal distribution of soil nitrates than furrow irrigation.

A short bibliography is appended.—*A. B.*

Soils Arid and Humid, Comparison of the Nitrifying Powers of. By C. B. Lipman, P. S. Burgess, and M. A. Klein (*U.S.A. Jour. Agr. Res.* vol. vii. No. 2, Oct. 1916, pp. 47–82).—A study of the nitrifying powers of some 40 humid and 150 arid soils obtained from the various State experimental stations showed the following results:

The nitrifying powers of humid soils are greater than those of arid soils with regard to soil nitrogen and dried blood nitrogen. Arid soils, however, nitrify sulphate of ammonia and cotton-seed meal with much greater vigour than do humid soils.—*A. B.*

Soils, Availability of Potash in certain Orthoclase-bearing, as affected by Lime or Gypsum. By L. J. Briggs and J. F. Breazeale (*Jour. Agr. Res.* viii. Jan. 1917, pp. 21–28).—It is thought that the application of lime to a soil liberates potash from the soil minerals. The point is of importance to the Citrus industry of Southern California, where heavy applications of lime and gypsum are sometimes made.

Samples of pegmatite and orthoclase, as representative of the potash-bearing rock and mineral from which much of the Citrus soils are derived were finely ground and shaken for a number of days with aqueous solution of calcium hydroxide and calcium sulphate in various strengths. The calcium hydrate solutions did not modify the solubility of potash in either the pegmatite or orthoclase, while the gypsum solution depressed the solubility of potassium in the orthoclase as the strength of the gypsum increased.

It was found that similar results followed the addition of gypsum in a Citrus soil which was under cultivation as well as in virgin soils. The experiments tend to show that the availability of potash to plants in soils of an orthoclase nature is not increased by the addition of lime or gypsum, but rather a depression in the solubility of potash occurs under such conditions.—*A. B.*

Soils, Calcium Compounds in. By E. C. Shorey, W. H. Fry, and W. Hazen (*Jour. Agr. Res.* viii. Jan. 1917, pp. 57–77).—In this paper are given analyses of sixty-three samples of soils from nineteen different States. The quantities of calcium carbonate, calcium sulphate, calcium combined with humus compounds, and calcium silicates have in all cases been accurately determined. The figures obtained showed a wide variation in the total calcium content and in the content of $CaCO_3$ and the two classes of silicates. Calcium combined with humus was present in thirty-four of the samples only. No relation was apparent between the total calcium content and the quantity of any of the classes of calcium compounds. It was found that it is possible to have two soils with the same calcium content but with the kinds of calcium compounds present in quite different quantities. A good alfalfa soil is characterized by a high calcium content, but low in content of calcium carbonate.—*A. B.*

Soils, Fixation of Ammonia in. By J. G. McBeth (*Jour. Agr. Res.* ix. April 1917, pp. 141–155).—The author points out that the capacity of a soil to serve as a source of plant food depends upon its power to retain water-soluble substances, like potash, phosphoric acid, and ammonia, against the leaching action of rains. He finds that many semi-arid subsoils have the power of fixing ammonia in large quantities, and much of this ammonia cannot be removed by the ordinary methods of analysis. If the soil is treated with 10 per cent. HCl the amount of ammonia extracted is the same as when the soil is treated and distilled with MgO. Anions have little or no influence on ammonia-fixation in soils. The amount of fixation is increased with rise in temperature, the fixation being

most rapid during the first few minutes, though the process appears to continue for several days. Heating a soil for six hours at a temperature of 200° C. and over reduces its power of ammonia-fixation. Aluminium, iron, and potassium salts added to soils prior to the addition of ammonia reduce the ammonia-fixing power of the soils to a marked degree, while calcium, magnesium, and sodium salts have little effect on this power in semi-arid soils.—*A. B.*

Soils of the Southern Island of New Zealand, with Special Reference to their Lime Requirements. By Leonard John Wild (*Jour. Agr. Sci.* viii. 2, pp. 154–177; March 1917).—This work was undertaken by the author with a view to testing the applicability of Hutchinson and MacLennan's method (*Jour. Agr. Sci.* March 1915) to New Zealand soils. The essence of this method is the treatment of a known weight of soil with a known volume of calcic bicarbonate of known strength, afterwards determining by titration with standard acid the loss of lime suffered by the solution. This loss is deemed to be the lime requirement of the soil. Hutchinson and MacLennan state, with reference to barley plots at Woburn, that in all cases where the soil is neutral in reaction high returns are obtained, but where the lime requirement is more than 18 per cent. (corresponding to 1 ton of quicklime to the acre) the crop shows almost if not complete failure.

The New Zealand work does not accord with the Woburn experience. In his experiments the author did not obtain concordant results, the difference in indicated "lime requirement" of the same soil being as much as 25 per cent., and one soil which contained so much as 10 per cent. of calcic carbonate yet indicated a small lime requirement. Further experiments on washed sand, a limestone soil, samples of soil already presumably saturated by the bicarbonate solution, and finally on the bicarbonate solution itself, suggested that calcic bicarbonate solution might undergo change, but whether chemical or physical the author has not ascertained.

Tests were next made of the time necessary for the completion of the reaction, and of the effect of using solutions of bicarbonate of varying strengths. Hutchinson and MacLennan recommended a strength of about $\frac{N}{50}$ and a period of four hours. Broadly speaking, the author agrees that these will generally give satisfactory results from a practical standpoint, but adds that the position from a theoretical standpoint is unsatisfactory since his experiments indicate that the "lime requirement" is not constant, but varies directly as the concentration of the bicarbonate solution. Field experiments also afford discrepant results: some New Zealand soils possessing an indicated acidity of less than 0·1 per cent. nevertheless are known to demand lime and cannot be farmed without lime dressings. Other soils possessing a decided acid reaction will yet give good crop returns without liming.—*J. E. W. E. H.*

Soils, Semi-arid, Nitrification in. By W. P. Kelley (*U.S.A. Jour. Agr. Res.* vol. vii. No. 10, Dec. 1916, pp. 417–438).—In these experiments the author shows the amount of nitrate formed from dried blood, bone meal, and ammonium sulphate varied greatly during four weeks' incubation when different concentrations were employed. This is true in regard both to the absolute amount of nitrate formed and the percentage of nitrogen added that was nitrified.

When 1 per cent. of dried blood was used, the nitrifying activity was feeble or even negative in certain soils in which 1 per cent. of bone-meal, and ·2 to ·3 per cent. of ammonium sulphate underwent active nitrification. However, when low concentrations of dried blood were employed, active nitrification took place in every case, and when equal amounts of actual nitrogen were added the yields of nitrates were similar, whether it was derived from dried blood, bone-meal, or ammonium sulphate.

It was found that high concentrations of bone-meal with a nitrogen content were highly toxic to nitrification, very much as was the case with 1 per cent. dried blood.

The inability to nitrify 1 per cent. of dried blood was not confined to any one type of soil, or to soils low in organic matter, as many varying types of soil were employed from different localities in Southern California.—*A. B.*

Soils, The Shrinkage of. By H. A. Tempany (*Jour. Agr. Sci.* viii. June 1917).—Observations by previous experimenters on thirty-four different types of soils in St. Lucia and Dominica had established the fact of the correlation between the shrinkage of the soils when dried and their suitability for growing cacao. A linear shrinkage (as determined by measuring the distances between marks on soil blocks at different stages of dryness) of 10 per cent. or more in

surface soil indicates unsuitability for cacao growing. The limits of shrinkage range from 2 per cent. in an open sandy soil to 16 per cent. in an exceptionally heavy clay.

The author has made corresponding and further investigations of soils in the Leeward Islands. He attributes shrinkage to the action of a gel. At the point of maximum plasticity all the water present in the experimental blocks of soil is probably in union with the colloid matter present as a gel occupying the whole of the interstitial spaces of the soil and forming a network which, as water is lost, draws the soil particles together. The cubical contraction observed is equal to the volume of water evaporated from the block until the point is reached where internal friction begins to exert an influence. Further, the author finds that there is a roughly constant ratio between the percentage of soil particles less than 0·01 mm. in diameter and the percentage linear shrinkage.

Pore space is related to linear shrinkage, and is determined by measuring the true density (D_1) of the soil, and the apparent density D_2. The pore space (P) is then given as a percentage by $P = \frac{D_1 - D_2}{D_1} \times 100$. D_2 is determined by weighing blocks of soil coated with a thin layer of wax of known specific gravity. When the percentage pore space is plotted on the x-axis against linear shrinkage (L) on the y-axis a straight line curve is obtained, of which the extreme points are given by $L = 1$, $P = 27·7$ and $L = 13$, $P = 12·5$. If this straight line is continued both ways it cuts the axes at $x = 28$ and $y = 23·5$. It is known that the figure 28 approximates to that of the pore space found to exist in uncontracted coarse sand of uniform texture. What is the significance of the figure 23·5? It is the point where the linear shrinkage is 23·5 per cent. and the pore space zero. That is, it is a limit representing an imaginary soil entirely composed of pure dry colloidal clay, the dimensions of whose colloidal particles approach to the molecular order of magnitude. Since the distance through which the curve is extrapolated is considerable, the above figure can only be accepted as moderately approximate; the curve does nevertheless enable us to calculate, to the same degree of approximation, the true colloidal content of a soil from a measurement of its percentage linear shrinkage, and thus to measure easily what it has not been possible hitherto to measure with any accuracy even by the best methods of physical analysis. Full experimental details with illustrations of the apparatus employed are given in the paper.

J. E. W. E. H.

Spruce and Balsam Fir Trees of the Rocky Mountain Region. By George B. Sudworth (*U.S.A. Dep. Agr., Bull.* 327, Feb. 19, 1916).—The spruces are important forest trees, and some are much planted for ornament. They yield superior saw timber, the straight and even-grained wood being used for a great many commercial purposes, including paper pulp, for which it is unsurpassed.

Seven species are indigenous to North America, and all occur within the United States. Four species occur over the western half of the United States, and three through the north-eastern States and Canada, two extending from the Great Lake region into Alaska.

Black spruce is mainly an eastern and far northern species, but occurring in the Canadian Rocky Mountain region. There it is from 25 to 40 feet high and from 4 to 8 inches in diameter. In its wider eastern range this tree exceptionally attains a height of from 50 to 75 feet and a diameter of about 1 foot; very occasionally it grows to 100 feet in height and 2 to 3 feet in diameter.

White spruce has its main range in north-eastern United States and Canada. It varies in height, according to situation, from 15 to 75 feet and in diameter from 12 to 20 inches. The largest trees occur in the East, where the height is from 80 to 100 feet or more and the diameter from 24 to 36 inches. Trees 3 or 4 feet in diameter and over 100 feet are rather rare.

Engelmann—*Picea Engelmanni*—is known to lumber men mostly as 'spruce,' while some call it 'white spruce,' probably because of its resemblance to the true white spruce (*P. canadensis*), with which they may have become acquainted in the East. It is, however, commonly known to foresters and botanists as Engelmann spruce, a name which it is hoped may be generally adopted, both because of its distinctness and the fact also that it commemorates the name of one of the ablest students of western trees. It is cut extensively for lumber, which is used for general construction and to some extent locally for interior finish. The timber is also much used for temporary or light traffic ties, telephone and telegraph poles, mine props, fuel, house logs, and corral poles.

Abies balsamea (Linn.) Miller is found only within the Canadian Rocky Mountain region. It extends southwards into the United States only from the

Great Lakes and North Atlantic regions, and has several names, the most appropriate of which is 'balsam fir,' coined from the tree's technical name.

Abies lasiocarpa (Hook.) Nuttall is one of the smallest of the western firs and perhaps also one of the least known there, owing to the fact that it grows chiefly at high altitudes. The common name, 'alpine fir,' adopted here, would seem to be the most appropriate one for this species, because it refers to the tree's high mountain habitat. Woodsmen and settlers usually call it 'balsam' or 'mountain balsam.'—*A. D. W.*

Stocks used by the Chinese. By Frank N. Meyer (*Queensland Agr. Jour.* p. 254; Oct. 1916).—In the neighbourhood of Tientsin Chinese gardeners graft flowering plums upon *Amygdalus Davidiana*, which they call by a name meaning literally "Mountain peach-tree"; Chrysanthemums are grafted on wormwood (*Artemisia*), tea olives (*Olea fragrans*) on privet, and junipers upon the Arbor vitae (*Thuja orientalis*). The Chinese, in North China, at least have tried to find congenial stocks which have root systems that are better suited to dry and alkaline soils than were the root systems of the plants themselves.—*C. H. H.*

Sugar-Beet Breeding, Some Recent Investigations in. By F. J. Pritchard (*Bot. Gaz.* Dec. 1916, p. 425; 51 figs.).—The author gives the following summary of his investigations :—

1. Differences in the size and sugar content of individual beet roots show no evidence of inheritance. They are fluctuations, therefore, and apparently play no part in beet improvement.

2. No correlation was discoverable between percentage or quantity of sugar in sugar-beet roots of ordinary sizes and their yield of seed and the average percentage of sugar in their progeny.

3. The fluctuations of beet families planted in progeny rows in alternation with check rows exceeded their real differences, but real differences were distinguishable by the use of a large number of replications.

4. Areas of beets in an apparently uniform field of small dimensions showed a difference of 2 per cent. sugar.

5. Percentage of sugar and yield of sugar of sugar-beet rows vary independently.

6. The average weight of root from a row increases with yield of sugar and decreases with percentage of sugar.

7. The discontinuance of selection for one generation caused no deterioration in percentage of sugar. In fact, there was some apparent gain.

8. No improvement in yield or percentage of sugar was obtained by continuous selection. Both the good and the poor families transmitted average qualities.—*R. J. L.*

Sulphur, The Relation of, to Soil Fertility. By O. M. Shedd (*U.S.A. Exp. Stn. Kentucky, Bull.* 188, December 1914).—Sulphur is an important factor in the maintenance of soil fertility. It is rapidly oxidized to sulphates in soil, the more fertile the soil the greater the oxidation. Sulphur produces acidity, and should only be used in conjunction with calcium carbonate.

Experimental results show that the sulphates of magnesium, iron, sodium, potassium, ammonium, gave the best results as compared with carbonates, only four in thirty-eight trials gave less yields than checks.—*C. P. C.*

Sunflower 'Excelsior.' By F. Bonvallet (*Le Jard.* vol. xxxi. pp. 100, 101; 2 figs.).—'Excelsior' is a hybrid of *Helianthus cucumerifolius* var. *purpureus* and *H. annuus* var. *gaillardioides*. It is robust, attaining a height of six feet, and very floriferous. The central disc of the flower rarely exceeds in dimensions that of *H. cucumerifolius*. It is surrounded by a reddish-purple or blood-red zone with a yellow aureole. The plant is easily raised from seed in a hotbed, if the outer husk is chipped.—*S. E. W.*

Sunflower, 'Excelsior.' By F. Cayeux (*Rev. Hort.* vol. lxxxix. p. 268; 1 col. plate).—*S. E. W.*

Surface Forces in Soils, Measurement of. By C. A. Shull (*Bot. Gaz.* vol. lxii., July 1916; 5 figs.).—It was found that the water-holding power of soils at the wilting coefficient was less than the osmotic pressure of the root hairs of many kinds of plants, as shown by Hannig and others. Thus the wilting of plants at the wilting coefficient of the soil cannot be due to lack of moisture in the soil, nor to lack of a gradient of forces tending to move water towards the

plant. The author concludes therefore that the wilting at this critical soil moisture content must be due to the increasing slowness of water movement from soil particle to soil particle, and from these to the root hairs, the rate of movement falling below that necessary to maintain turgidity of the cells of the aerial parts, even under conditions of low transpiration.—*R. J. L.*

Swede Turnips, Hydrolysis of the Soluble Protein of. By G. Williams (*Jour. Agr. Sci.* viii. pt. 2, pp. 182–215; March 1917).—The total weight of swedes grown in the United Kingdom is twenty-five million tons, and is thus greatly in excess of any other fodder crop. Recent work on the chemistry of nutrition shows that the average composition of the protein consumed by an animal should, in respect of the amino acids contained in the protein, approximate as nearly as possible to the protein of the body. A ration containing an excess or a defect of amino acids will result in the uneconomical utilization of the protein as a whole. Hence the importance of knowing the proportions of amino acids in the protein of various feeding materials.

To prepare the protein the juice is pressed from shredded turnips, and after filtration is heated in beakers up to 90° C. for thirty minutes. The protein which is thus precipitated as a white curd is washed repeatedly, first with hot water, then alcohol, and lastly ether, and is finally dried *in vacuo* over sulphuric acid. The product is a light grey, easily powdered mass. Six litres of juice give six grams of protein, containing 14 to 16 per cent. of nitrogen. The determination of the diamino acids arginine, histidine, and lysine was carried out according to the methods of Kossel, Kutscher, Patten, and Steudel. Foreman's method (*Jour. Agr. Sci.* iv. 31, 1911) was followed for the amino acids proline, alanine, glycine, leucine, and valine.

Other amino compounds were also estimated, viz. tyrosine, cystine, aspartic and glutamic acids. The percentages of the sixteen amino and other compounds determined are given.—*J. E. W. E. H.*

Tar Water for Thrips. By C. French (*Jour. Agr. Vict.* Oct. 1916, p. 606).—Boil 1 lb. coal-tar in 2 gallons of rain-water, and while hot add from 50 to 100 gallons of water; spraying with this tar-impregnated water, or a weak paraffin emulsion, is recommended as a deterrent for thrips.—*C. H. H.*

Thielavia basicola, New Hosts of. By J. Johnson (*Jour. Agr. Res.* vii. pp. 289–300, Nov. 1916; plates).—This fungus has been reported upon thirty-nine different hosts, mainly members of the Leguminosae, Solanaceae, and Cucurbitaceae, with a few representatives of other families. The author adds sixty-six new hosts, twenty-eight of which are legumes, twenty belong to Solanaceae, seven to Cucurbitaceae, and eleven to various other families. He considers *Phaseolus multiflorus*, *Nicotiana rustica*, *Scorzonera hispanica*, *Daucus Carota*, *Apium graveolens*, *Beta vulgaris*, and *Pastinaca sativa* should, pending further experiments, be excluded from the list. He found great differences in susceptibility to attack existing among various species, but there appear to be no specialized races of the fungus, since nearly 100 different species of plants were infected with *T. basicola* from the tobacco.—*F. J. C.*

Timber, The Neglect of Home. By Sir Robert Lorimer (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 103–108; July 1916).—Among the rarer woods, which might be more grown and which would be much more used in cabinet work if they could be got with any certainty, are cedar, gean (wild cherry), mulberry, laburnum, holly, cherry, and yew. Yew stands almost by itself. It is a most beautiful wood for cabinet work, and owing to its scarcity it is almost always used in the form of veneer. If left for some length of time in pond water, or, better, if a log can be got that has been long submerged in a bog, it becomes a lovely purplish violet colour, cooler in colour than the famous West Indian King wood which the French are so fond of using in their fine veneered cabinet work.—*A. D. W.*

Timbers, Durability of. By Percy Groom (*Trans. Roy. Scot. Arb. Soc.* vol. xxx. pp. 44–46; Jan. 1916).—According to observations made in French coal-mines the following represents the order of durability of pit-props (beginning with the most and ending with the least durable) made of different woods: (1) oak, (2) Scots pine, (3) alder, (4) ash, (5) cluster pine, (6) *Robinia Pseudacacia*, (7) willow, (8) maple, (9) elm, (10) aspen, (11) cherry, (12) birch, (13) hornbeam, (14) beech, (15) poplar (not aspen). Not perfectly in accord, but mainly so, were the results obtained by R. Hartig with buried wood (heart-wood or its equivalent). He found (*a*) most durable, larch, Scots pine and *Robinia Pseudacacia*; (*b*) less durable, oak and elm; (*c*) still less durable, common silver fir and Norway spruce; (*d*) least durable, lime, birch, beech, and poplar.—*A. D. W.*

Tobacco Mosaic Disease, a Specific Form of. By H. A. Allard (*Jour. Agr. Res.* vii. pp. 481–7, Dec. 1916; pl.).—A few plants of *Nicotiana viscosa* developed mosaic disease in a field. They were further studied and the virus from them proved infectious to other plants of *N. viscosa* and its hybrids with *N. Tabacum*, but not to *N. Tabacum*. Attempts to infect *N. viscosa* from *N. Tabacum* affected with mosaic disease proved abortive, and the hybrids between *N. viscosa* and *N. Tabacum* also proved immune from the attacks of mosaic disease when inoculated with the virus from *N. Tabacum*. The hybrids were externally very much like the seed parent, *N. Tabacum*.—*F. J. C.*

Tobacco, Some Properties of the Virus of Mosaic Disease of. By H. A. Allard (*Jour. Agr. Res.* vi. pp. 649–674; 1916).—Some investigators have attributed the occurrence of mosaic disease of tobacco (and other plants such as tomato) to the presence in abnormal quantities of oxidases and peroxidases, but the origin of the disturbances which have caused the development of these abnormal amounts are somewhat in doubt. The author shows that the infectivity of the sap from diseased plants is destroyed by alcohol of 75 to 80 per cent. but not of 45 to 50 per cent. The peroxidases may be destroyed by hydrogen peroxide without adversely affecting the virus. Weak formaldehyde solutions do not destroy the virus, but when stronger concentrations are used the solutions are no longer infective, although peroxidase reactions may be intense. Ether, toluene, chloroform, carbon tetrachloride, and acetone all failed to destroy the infectious principle in mosaic leaves, but it is quickly killed at temperatures near boiling point of water. The virus is highly resistant to low temperatures, enduring a temperature of −180° C. without weakening its infective powers. Other observations, together with the foregoing and the fact that mosaic disease does not occur in absence of infection, lead the author to conclude that "a specific, particulate substance not a normal constituent of healthy plants is the cause of the disease. This . . . agent is highly infectious and is capable of increasing indefinitely within susceptible plants . . . it is an ultramicroscopic parasite of some kind."—*F. J. C.*

Tomato and Bean Bug. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 649–650; 1 plate).—The adult Tomato and Bean Bug (*Nezara viridula*) is shield-shaped. It is of a rich green tint, and easily escapes detection on the foliage of a tomato plant. The eggs are laid on the surface of the leaves. These leaves should be cut off and destroyed. The adults can be shaken off the plants on to a sheet.—*S. E. W.*

Vanillin, A Field Test with the Toxic Soil Constituent. By J. J. Skinner (*U.S.A. Dep. Agr. Bur. Soils, Bull.* 164, Jan. 1915).—Vanillin is found as a constituent in many plants and soils. When isolated it is toxic to plants in varying degrees, according to type of soil and its concentration therein.

It is demonstrated that while 400 to 500 parts per million of vanillin proved harmful in one soil, it had much less effect in another.

Field results on an area of 8½ square feet gave the following decreases:—

Cowpeas, 33 per cent. green hay
" 35 " pods
Garden peas, 30 per cent.
" " 20 "
String beans, 336 lb.; vines, 122 lb. pods from an acre.

The ill effect of vanillin persisted, and was harmful to plants six months after crops were harvested.—*C. P. C.*

Vegetable Crops in Porto Rico, Insects Affecting. By Thomas H. Jones (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 192; April 1915; 4 plates).—Upwards of thirty-nine varieties of insects attack vegetables in Porto Rico, many of which already occur in the United States. Several, however, are not known to be present on the mainland. This bulletin is the result of an effort made by the Dep. Agr. to obtain information upon obnoxious insects liable to introduction.
V. G. J.

Vegetative Succession under Irrigation. By J. F. MacBride (*Jour. Agr. Res.* vi. pp. 741–759; August 1916; plates).—This is a valuable contribution to our knowledge of the changes that occur in vegetation through interference with natural conditions. Land periodically flooded in order to form artificial pasturage was studied, and the sequence in which various plants originally forming part of the vegetation were killed out and replaced by *Deschampsia caespitosa*

and *Agropyron* sp., which form the two most valuable pasture grasses of the district, is recorded.—*F. J. C.*

Weeds of New South Wales (continued). By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxvii. pp. 865–867; vol. xxviii. pp. 46–48, 131–133, 181–184, 244–245; 8 col. plates).—Coloured plates represent the Poison Buttercup (*Ranunculus sceleratus*), the Rough-seeded Buttercup (*R. muricatus*), the Sow Thistle (*Sonchus oleraceus*), Cat's Ear (*Hypochaeris radicata*), Petty Spurge (*Euphorbia Peplus*), Bushy Starwort (*Aster subulatus*), St. Barnaby's Thistle (*Centaurea solstitialis*), Groundsel (*Senecio vulgaris*), Prickly Lettuce (*Lactuca scariola*), and *Soliva sessilis*. *R. sceleratus* should be dug up and destroyed on account of its poisonous properties.—*S. E. W.*

Western Plant Studies, IV. By A. Nelson and J. F. Macbride (*Bot. Gaz.* vol. lxii. No. 2, Aug. 1916).—The authors give detailed botanical descriptions of the following species:—*Plagiobothrys Harknessii*, n. comb.; *P. foliaceus*, n. comb.; *Cryptantha vincteus*, n. sp.; *Oreocarya dura*, n. sp.; *O. propria*, n. sp.; *Amsinckia carinata*, n. sp.; *Mertensia Palmeri*, n. sp.; *Pentstemon minidokanus*, n. sp.; *P. payetensis*, n. sp.; *Machaeranthera rhizomata*, n. sp.; *M. laeta*, n. sp.; *Macronema filiformis*, n. sp.; *M. glomerata*, n. sp.; *M. Walpoliana*, n. sp.; *M. scoparia*, n. sp.; *M. pulvisculifera*, n. sp.; *M. imbricata*, n. sp.; *Evax breviflora*, n. comb.; *Lactuca spicata* var. *multifida*, n. comb.—*R. J. L.*

Wetting Substances, Accessory, with Special Reference to Paraffin Emulsions. By A. H. Lees, M.A. (*Ann. Appl. Biol.* iii. No. 4, April 1917, pp. 141–149; tab.).—One of the most important points of a spraying fluid for insect or fungus pests is its wetting power. The addition of soft soap to certain proprietary insecticides increases their wetting powers and therefore their killing powers. Soap is ineffective against colonies of woolly aphis on account of the waxy thread coverings excreted by the insects, and the same trouble is experienced in the case of American Gooseberry Mildew.

Experiments with paraffin emulsions as "wetting agents" were very fully carried out. The cheapest and most effective mixture is a 2 per cent. emulsion (20 lb. soap to 100 gals. water, and 2 gals. paraffin to 100 gals. water). Its value lies not so much in its own killing powers but in its action as a carrier for other fungicidal or insecticidal bodies, which, alone, would not effectively eradicate the pest. Thus, liver of sulphur used with the 2 per cent. mixture has given promising results on a commercial scale against American Mildew. It has also been found possible to kill the raspberry beetle with the 20 per cent. mixture united with a dilute nicotine solution.—*R. C. S. R.*

Weymouth Pine in the Surrey Desert. By B. W. Adkin (*Quart. Jour. of Forestry*, x. pp. 185–193; July 1916).—The Weymouth pine is no recent introduction. It has been planted somewhat extensively in this country for about two hundred years. It ranks highly both for ornament and sylviculture. In its native land the Weymouth pine is said to have attained a height of from 150 to 175 feet, and a girth of 10 to 15 feet; but in Britain a height of 60 to 80 feet may be taken as an average; trees over 90 feet are rare, and the tallest ever recorded was but 122 feet high.

On suitable soils and situations Weymouth pine should give a better financial return than Scots pine, for three reasons: firstly, it should yield a larger number of cubic feet an acre on account of its more rapid growth and its greater shade-bearing properties; secondly, it should be ready to cut on a shorter rotation, and thus prevent such an accumulation of compound interest; and, thirdly, if a good market could be found for British timber, Weymouth pine should fetch a considerably higher price a cubic foot than Scots pine.

From all points of view, therefore, it would appear that Weymouth pine is to be regarded as a good tree to grow for sylvicultural purposes in Britain.—*A. D. W.*

Willows: their Growth, Use, and Importance. By George N. Lamb (*U.S.A. Dep. Agr., Bull.* 316, Dec. 20, 1915).—There are in the United States and Canada from eighty to a hundred species of willows, distributed from the Gulf of Mexico to the Arctic Circle, and from tide-water to the tops of the highest mountains. They range from a tiny plant a few inches high to a forest tree 4 feet in diameter and 140 feet in height. All the shrubbery species are useful as soil cover, forage, or basket material. Scarcely more than a dozen, however, are of prime economic

importance. Of these, six are species imported from Europe: the basket willows, which are the American green willow (*Salix amygdalina*), the Lemley willow (*S. pentandra*), and the purple willow (*S. purpurea*), and three tree willows, the white willow (*S. alba*), the crack willow (*S. fragilis*), and the weeping willow (*S. babylonica*). There is only one native tree species of wide distribution and importance, and this, the black willow (*S. nigra*), is found from coast to coast and from the Lakes to the Gulf.

The black willow is by far the most important of the native species. In the region of its best development, trees have been found 4 feet in diameter at breast-height and 140 feet in height. The leaves are long and narrow, gradually running out into a long, usually curved tip. They are thin, occasionally sickle-shaped, bright green, and rather shiny. In width they vary from $\frac{1}{8}$ to $\frac{3}{4}$ inch; in length from 3 to 6 inches, being usually about 3 inches. The buds are pointed, and $\frac{1}{4}$ inch long. The flowers, which are borne on catkins terminal on leafy branches, are from 1 to 3 inches long, with short yellow scales. The bark has characteristic corky protuberances on branches from one to three years old. These are particularly abundant on vigorous sprouts grown in the open and more occasionally in dense seedling stands. The bark of old trees is from 1 inch to $1\frac{1}{2}$ inches thick, occasionally 2 inches.—*A. D. W.*

Winter and the Rock Garden. By J. H. Scaife (*Irish Gard.* xii. June 1917, p. 82).—A chatty article, showing the effect the winter of 1916–17 had on the plants in an Irish rock garden. A contrast is made between the winter of 1915–16 and 1916–17, the former winter being mild up to March 1916 brought Saxifrages and many other plants out into flower in January. The writer tells us that Saxifrages have stood the weather well: certain Geraniums and Erodiums also have not suffered. But he says that Aethionemas, Lithospermums, and Hypericums have not been too happy; these fear east and north-east winds more than the cold.—*E. T. E.*

Winter Cultivation, Early and Late Compared. By E. E. Pescott (*Jour. Agr. Vict.* Sept. 1916, p. 574).—It is most important in Australia to plough the orchard early to take advantage of the moist surface and consequent easy ploughing; and also to conserve as large an amount of moisture in the soil as possible. The longer the ploughing is delayed, the less an amount of moisture is retained in the soil for summer use. Deferred ploughing certainly means dry soil, enfeebled trees, and diminished results. The earlier the ploughing, the more soil water is conserved. When the ploughing is completed, the clods should be crushed and the land harrowed, so that a fine earth mulch may be obtained. The orchard surface should be kept as level as possible, and no irregular ridging or furrows should be allowed. If plants of a leguminous nature are grown to supply humus, they give the best result if ploughed in when in full flower; if growth has been rank, the crop may be rolled before ploughing, or it may be mown, care being taken that the plants are distributed evenly over the ground, as large quantities in a mass should be avoided. Artificial or stable manures may be given the trees at the same time; they should be applied before ploughing.—*C. H. H.*

Wireworms. By C. L. Walton, M.Sc. (*Ann. Appl. Biol.* iv. Nos. 1 and 2, Sept. 1917; p. 7).—Where free use of lime, basic slag, kainit &c., was made on the land under observation cultivators seldom complained of wireworms. The majority of the affected areas were situated on sunny hill-sides where the soil was dry and shallow. In their energetic search for larvæ some damage was caused by rooks disturbing the young swedes.

In spite of abundant larvæ few adult beetles were observed.

On farm lands, harrowing in soot with subsequent rolling proved excellent. Fifteen cwt. of ground lime to the acre, mixed with the soil during preparation for roots, aided the clearance of the pest.—*R. C. S. R.*

Wood Preservatives, Tests of. By Howard F. Weiss and C. H. Teesdale (*U.S.A. Dep. Agr., Bull.* 145, April 12, 1915).—In general, highly viscous oils do not readily penetrate, while oils with low viscosities penetrate wood readily. As temperature strongly influences the viscosity of oils, and as the diffusion of the preservative through the wood is one of the most important factors in proper treatment to secure best results, both the wood and the preservative should be sufficiently heated during the pressure period. Because of the low thermal conductivity of wood the treatments should not be made too rapidly. With water-soluble salts these precautions are not important.—*A. D. W.*

Woodland Ash. By Sir Hugh R. Beevor (*Quart. Jour. of Forestry*, vol. x. pp. 249–253; October 1916).—The following prices a foot cube refer to regular sales from one thousand acres of woodland within a few miles of High Wycombe:

	Ash.		Oak.		Beech.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
1815	2	0	4	0	1	1½
1850–63	1	0	2	0		7½
1876–88	1	2	2	0½	1	3
1891	1	8	1	8	1	2
1909–1913	2	2	1	11	1	0¾

Even before the war ash timber was above the price of a century ago, and it has shown a steady rise in value during the past fifty years.

The great war is making an extraordinary inroad upon stocks; and this will greatly diminish supply.

In the varied dry and moist soil on the estate in question two features in the yield of ash call for attention—the quantity in relation to quality of soil, and the quantity in relation to pure or mixed crop an acre.

The yield on agricultural quality soil does not seem high—2,400 feet cube an acre, 1,380 of ash timber (twenty-seven trees), the rest oak with a few sycamore (thirty trees) was taken from a wood ninety years old. The ash were all sound, though not likely to continue so. However, the price standing of ash, 3*s.* 3*d.* a foot, made this wood a new record in many returns.—*A. D. W.*

Woolly-aphis-proof Apples. By E. E. Pescott (*Jour. Agr. Vict.* Oct. 1916, p. 621).—The following apples are included in a list of apples immune to woolly aphis in Australia: 'Emperor Alexander,' 'Annie Elizabeth,' 'Gravenstein,' 'Irish Peach,' 'London Pippin,' 'Northern Spy,' 'Reinette du Canada,' 'Winter Majetin,' and 'Winter Strawberry,' together with thirty-four Australian varieties.—*C. H. H.*

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 16, 1917.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (51).—Mrs. Aubrey-Fletcher, W. Baker, M.A., LL.B., J. A. Barnes, Mrs. F. J. Harvey Bateman, G. Bennett, Mrs. Bowden, James Brown, Hon. Mrs. F. C. Brownlow, Mrs. Burnaby-Atkins, Miss E. M. Clarke, A. L. Cotton, Mrs. M. Crofton, F. C. Dalgarno, Miss M. E. Edmonds, Herbert Evans, Mrs. A. S. Fleming, Miss L. M. Fowler, E. E. Green, Miss G. E. A. Gurdon-Rebow, Mrs. S. Hancock, Miss C. Harding, G. C. Hodgson, Miss E. L. Howl, Elisha Hulme, E. R. Janes, T. B. B. Ker, Mrs. G. Kinnaird, E. A. Lundy, T. P. P. McPhail, Miss E. L. Matthews, W. Morgan, W. E. Odlum, Lady Owen-MacKenzie, W. Player, Miss A. M. Pollard, Mrs. M. Prothero, A. D. Rawlings, Lady Royds, Major T. G. A. B. Sabine, Audrey B. Skimming, Joseph Smith, A. P. Street, T. Tongue, Cecil J. Webb, Mrs. E. H. Weller-Poley, Miss S. J. Welsh, M.B., Mrs. Arminel Werring, Mrs. H. S. Whitmore, Mrs. J. Wilkinson, H. Wallis Wood, Thomas Woolley.

Fellows resident abroad (2).—W. S. Johnston (New Zealand), Isaac Tribolet (South Africa).

Associates (5).—Miss K. A. Clarke, G. Fenton, J. G. Hagan, Miss M. Walden, Albert Webb.

Affiliated Society (1).—Wakefield Paxton Society.

GENERAL MEETING.

JANUARY 30, 1917.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (23).—Mrs. C. G. Anson, E. C. Bumpstead, Mrs. Campbell, Mrs. A. H. Cohen, W. N. Cosgrave, W. J. Crampton, W. Dandie, G. W. Garlick, W. R. Hillier, G. C. Howe, Miss F. E. Jones,

W. MacSweeney, C. W. Moore, E. Pickering, L. A. M. Riley, R. C. S. Ross, Thomas Ryan, T. A. E. Sanderson, M.A., K. M. Allan Smith, Mrs. F. Speyer, A. Taylor, R. W. Thorne, Mrs. R. Worsley.

Associates (2).—Miss M. L. Despard, D. W. Simmons.

ANNUAL GENERAL MEETING.

FEBRUARY 13, 1917.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (18).—Mrs. Berners, E. B. Bothwell, Miss Cook, A. Day, Mrs. C. W. Dunn, E. O. Griffiths, Miss D. Mainwaring, A. F. May, Mrs. A. F. May, Capt. T. W. C. Nevill, Miss C. Procter, Mrs. E. Pullar, Jesse Pye, W. Sherwood, Miss Swinscow, Miss E. M. Taylor, J. M. Williams, Mrs. Wills.

Associate (1).—Henrietta C. Tuke.

The CHAIRMAN moved the adoption of the Annual Report. This was seconded by Dr. KEEBLE, who briefly spoke upon the various items of War work being done by the Society, more particularly that of increased vegetable food production and the despatch of seeds to our base hospitals and camps in France and Salonika. The report was then carried.

The following names of President, Vice-Presidents, Members of the Council, and Officers having been duly proposed and seconded, and the list sent round in accordance with Bye-law 74, and no alternative name having been proposed, they were declared by the Chairman to be elected:

As President.—Field-Marshal the Right Hon. Lord Grenfell, G.C.B., G.C.M.G.

As Vice-Presidents.—The Duke of Bedford, K.G., F.R.S., the Rt. Hon. the Earl of Ducie, F.R.S., Leopold de Rothschild, Esq., C.V.O., Sir John T. Dillwyn-Llewelyn, Bt., D.L., J.P., V.M.H., the Duke of Portland, K.G., P.C., G.C.V.O., the Rt. Hon. James W. Lowther, P.C., Sir Daniel Morris, K.C.M.G., V.M.H.

As Members of Council.—Mr. W. A. Bilney, J.P., Lieut.-Col. Sir David Prain, C.I.E., F.R.S., V.M.H., Sir Harry J. Veitch, V.M.H.

As Treasurer.—Capt. and Hon. Major C. G. A. Nix.

As Secretary.—The Rev. W. Wilks, M.A., V.M.H.

As Auditor.—Mr. Alfred C. Harper.

V.M.H. Medals were handed to the following:

Mr. E. A. Bowles, M.A., F.L.S., the Hon. Vicary Gibbs, and Messrs. W. Slocock, Peter C. M. Veitch, and W. Watson.

The Rev. JOSEPH JACOB suggested that the time had come when the Charter of the Society should again undergo revision, so that the

Annual Meeting could be held at a later period in the year. He also said that he considered the small expenditure on the Library was a matter for regret, as it already compared badly with the Horticultural Libraries of Paris and Boston.

Mr. OAKS, of Southampton, also spoke on the subject of the Library, and expressed the hope that the Library might be more fully developed. As regards the revision of the Charter, he suggested that this was not the proper time to take up this matter because of the cost it would involve.

Mr. BOWLES explained that the present time was far from favourable for the purchase of valuable books for the Library, because of the inflated prices they were fetching in America, where the money of the whole world seemed to be concentrating.

Mr. WALLACE introduced the question of the Society's funds being invested in the New War Loan, and proposed the following Resolution:

> "That in the opinion of this General Meeting the Council will be well advised to increase the Society's investment from £10,000 to £20,000 in War Loan in view of the Society's strong financial position."

This was seconded by Miss COLT.

Mr. OAKS suggested as an amendment that the amount to be subscribed be left to the discretion of the Council. This was seconded by Miss BRYAN.

On the amendment being put to the Meeting it was lost by 16 votes to 27.

The CHAIRMAN then put the original motion, which was carried.

Mr. GERALD LODER proposed a vote of thanks to the Chairman, which was carried with acclamation.

REPORT OF THE COUNCIL FOR THE YEAR 1916.

1. **The Year 1916.**—With the single exception of 1887–8, which may be called "The year of the Society's Reconstruction," there has probably never been a year of such continued anxiety, strain, and stress, as the one now just ended; and though the twelvemonth is ended, the strain and stress bid fair to continue. The Council have had most difficult matters to decide, and have had constant deliberations as to how best to meet, and promote, all reasonable national interests, without altogether sacrificing the position of the Society (itself an asset of the National welfare) with the safeguarding of which they are specially charged.

At the first outbreak of the War the Council decided on the general line of policy which the Society ought to adopt, viz.—to place itself, its resources, and its buildings in every possible way at the disposal of the Government for national military requirements, and to endeavour to increase to the utmost the general supply of fruit and vegetable food-products of the whole country—and this policy they have kept ever in view.

2. **Increase of Garden Produce.**—It will be remembered that on the very first day of the War the Society sent a letter to the Press pointing out the urgent necessity for increasing the fruit and vegetable produce of the country. This was followed by the free issue of 100,000 leaflets containing directions how this could best be done so as to yield an immediate result during the following winter. At the same time a Central Bureau was established at Vincent Square for the collection and distribution of seedling vegetable plants, which the Society sent out to a number not far, if at all, short of a million. These preliminary efforts being well started, the Society next prepared a series of War Pamphlets, dealing *inter alia* (1) with the most efficient means for cropping gardens, (2) economy both in labour and material, (3) the preservation of produce, and (4) utilizing it to the best purpose. Sixteen of these Pamphlets were drawn up, and 90,000 of them have already been issued *; and of the Gardeners' Diary for 1916—specially designed to meet War-time needs—no less than 50,000 have been sent out. These figures are some indication of how important and far-reaching the influence of the Society is.

These efforts, strictly within the province of the Society, were followed by strong and urgent representations to the Government to grant power to Local Authorities, under the Defence of the Realm Act,

* Five further Pamphlets are now ready or in the Press, viz.:—The Cultivation and Manuring of the Kitchen Garden, The Potato as a Garden Crop, Fruits under Glass in War Time, The Pruning of Hardy Shrubs, The Children's Garden.

to put waste lands under cultivation, and to defray the necessary expenditure upon it; the influence of which representations may be traced in the Order in Council published on December 8 granting to the Board of Agriculture the very points for which the representatives of the Society had so urgently pleaded.

3. **The Hall.**—It will be remembered that in 1914 the Society voluntarily gave up its Hall for the use of the Westminster Dragoons who occupied it for several months, when it was again returned to the Society. The next request for its use was made on behalf of the Australian Imperial Force, in the early part of July—a request which, in accordance with the Council's policy, was without hesitation agreed to—but owing to unforeseen difficulties at the War Office the Australians were not able to move in until the last month of the year.

4. **Temporary Premises.**—Owing to the occupation of our own Hall by the Australians, the War Office, recognizing the National importance of the Society's work, have secured for our fortnightly Meetings the use of the London Scottish Drill Hall in Buckingham Gate, Victoria Street, just opposite the Army and Navy Stores—the same Hall in which our Meetings were held from 1888 to 1904. The Offices of the Society and the Library will remain at Vincent Square as heretofore.

5. **British Base Hospital and Camp Gardens in France.**—At the commencement of the year, large quantities of plants and seeds were purchased and sent out to the British Base Hospitals and Camps in France for planting there. Many expressions of appreciation have reached Vincent Square, including an extract from a note on a visit to France by Sir James Kingston Fowler, K.C.V O., saying how well furnished these gardens were, largely as the result of the plants and seeds supplied by the Society.

The following is from one of many other letters received from the War areas: "May I express my deep gratitude, and that of the officers of this camp, for the splendid gift of fruit and vegetable seeds sent by the R.H.S. and received here to-day? It is difficult to tell you how very much your generosity is appreciated, more especially as we know what large calls have already been made upon it. Your unexpectedly kind response to my appeal will be the means of giving pleasure to hundreds of convalescents during the summer and autumn. With renewed thanks, I am, ——."

The Council particularly desire to thank Messrs Hurst, Mr. Slocock, and Mr. Jackman, amongst others, by whose generous assistance, coupled with that of our own gardens at Wisley, more than 10,000 plants and many thousands of packets of seeds have been sent out.

6. **Vegetable Seeds to the Troops in Salonika.**—In consequence of representations made to the Society, steps were taken in 1915 for rendering immediate relief to the horticulturists of Serbia. Acting in

co-operation with the Royal Agricultural Society, and on the advice of an Agent who was sent out by the two Societies jointly to report upon the conditions and needs of that country, a large consignment of seeds was despatched before it was suspected that Serbia would again be overrun. As a result of the change which afterwards arose in the military position, the seeds were stopped at Salonika and distributed amongst the British and French troops stationed there and at Malta, so that they were turned to good and profitable national use.

7. **Laying Out Cemeteries in France.**—The Council have received, and accepted, an invitation to co-operate, when the time comes, with the Committee, of which H.R.H. the Prince of Wales is President, for laying out and planting the cemeteries in France where the bodies of so many of our brave fellow-countrymen lie.

8. **"Star and Garter" Hostel.**—The Council have also offered to plant the garden of the "Star and Garter" Hostel at Richmond for Officers incurably wounded, which offer having been accepted they will proceed with the work as soon as the site is ready. The work will be rendered less onerous from the offer of plants by Mr. Leopold Rothschild and others.

9. **Red Cross Sale.**—In June a Sale of Plants, &c., was held by the Society at Vincent Square. Fellows and their friends were invited to contribute plants and horticultural books, pictures, and sundries. The response was so generous that the Sale, which was originally intended to occupy two days, had to be extended to three to enable the Auctioneer to get through the catalogue of nearly 3,000 lots. Messrs. Prothero & Morris most kindly gave their services as auctioneers, Mr. Byam Shaw designed the very attractive cover of the catalogue, and Sir Owen Seaman wrote the dedicatory verses. Mr. Bradbury of the Whitefriars Press also gave generous assistance by charging only the actual net cost price of the printing. These combined efforts produced a really remarkable catalogue which contributed in no small degree to the general result, namely, that £2,203 has been handed to the Red Cross Society. The Council extend their warmest thanks to all who so readily co-operated to make a most difficult sale the great success which it achieved.

10. **Other Items of War Work.**—Among other items of work bearing upon the War which the Society has taken in hand are the following:

(1) Many large cases of bulbs and seeds, collected from the Fellows and friends of the Society, have been sent to the English Prisoners' Camp at Ruhleben.

(2) Offer of co-operation with the Government in the Land Development Scheme, and giving cognate facilities at Wisley.

(3) Offer of training in Horticulture to disabled Officers.

(4) Offer of expert advice to Local Authorities on the growing of vegetables on unoccupied lands.

11. **Staff Enlisted.**—There has been a further response on the part of the Society to the call for men. The total number from our Staff and Students (past and present) serving is 118, of whom five have laid down their lives for their country. Two, Capt. Ferris Grant and Lieut. J. C. Powell, have been awarded the Military Cross, whilst Sergt. H. W. Abbis has won the Distinguished Conduct Medal. Capt. Page, the Society's Chemist at Wisley, was severely wounded, but is now making a satisfactory recovery.

12. **War Relief Fund.**—On December 31 the total amount received and promised for our War Relief Fund amounted to over £14,000. The increase during the twelve months has been almost entirely due to the hard work and unflagging zeal of Lady Northcote, C.I., President of the Ladies' Committee, the Vice-Presidents, the ladies of the Committee, and the County Presidents. Their patient and untiring efforts have brought about a result which ought to be as gratifying to themselves as it is to the Council. By the holding of garden fêtes, meetings, entertainments, and such-like, considerable sums have been collected. Whilst it would be invidious to mention particular names where all have worked so energetically, the Council desires to make two exceptions and to specially thank Lady Northcote for her extraordinary zeal in the cause, and Mrs. Lowther for the highly successful meeting held at the Speaker's House on May 24. During 1917 the work of the Ladies' Committee will be continued. A List of Subscriptions accompanies this Report [not reproduced here].

13. **The Laboratory at Wisley.**—The magnificent laboratories at Wisley have been completed during the year (see *R.H.S. Journal*, vol. xlii., pt. 1), and work, with such staff as is available, has commenced. During the year the following problems, among others, have been under investigation:

(1) The so-called Fusarium disease of Narcissi, by Mr. J. K. Ramsbottom (Research Student).

(2) The control of American Gooseberry Mildew, and the effect of Burgundy mixture in preventing the summer stage of the disease on the berries, by Dr. A. S. Horne.

(3) Rose Mildew and Apple Fruit Spot, by Dr. A. S. Horne.

(4) The effect of electrical discharge on the yield of market garden crops, by Mr. F. J. Chittenden, F.L.S., in collaboration with the Imperial College of Science and the Board of Agriculture.

(5) Problems connected with pollination in orchards, and with the fruiting and growth of fruit-trees, by Mr. F. J. Chittenden, F.L.S.

(6) Breeding of hardy peas, by Dr. Keeble, F.R.S.

(7) Breeding of strawberries, blackberries, and other Rubus fruits, by Dr. Keeble, Mr. Wright, and Mr. Wilson.

(8) Breeding of hardy Primulas, by Dr. Keeble and Mr. Blakey.

14. **Board of Scientific Studies.**—The Royal Society having appointed a Board of Scientific Studies, the Council were invited to nominate a representative to serve upon it, and the name of Dr. Frederick Keeble, F.R.S., Director of Wisley, was accordingly given.

15. **Neglect of Science.**—The Society was also asked to send representatives to attend a Meeting called to consider the subject of the "Neglect of Science," and Mr. Arthur W. Sutton, V.M.H., and Dr. Frederick Keeble, F.R.S., were appointed.

16. **Chelsea and Holland House Shows.**—The Chelsea and Holland House Shows were held in somewhat modified form more in accordance with the times. The Council have had great anxiety in coming to a decision whether to hold these two large Shows in 1917, and had at first decided to continue them, but, added to the trouble arising from the shortage of labour, the difficulties of transport, and the Government's desire to reduce travelling to the utmost possible extent, they now find themselves confronted with a further difficulty that at the last moment the Contractor has reported that he cannot guarantee to get up the tents. For all these reasons the Council have decided to abandon these Shows. In arriving at this decision, which has been adopted on patriotic grounds, and after the most careful consideration of all the points both for and against it, the Council hope they will have the support and approval of every Fellow of the Society.

In the place of these two Shows ordinary Fortnightly Meetings will be held at the London Scottish Drill Hall, Buckingham Gate, on the usual fortnightly dates, namely, May 22 and July 3.

17. **Dry Bulb Show.**—In August the first Show of Dry Bulbs which the Society has ever held took place at Vincent Square, and proved a great success. Its object was to call attention to, and encourage, a future British industry. A Conference was held in the afternoon at which the subject of the Bulb Trade was considered.

18. **Tulip Report.**—The report on the Tulip Trials, undertaken before the outbreak of War, has been unavoidably delayed, more particularly through the difficulty of communication between the English and Dutch members of the Committee. The report is, however, now in the Press, and its issue may be expected at an early date. Its price will be 2*s.* 6*d.* post free.

19. **Fruit List.**—The "List of the Most Desirable Varieties of Fruits," drawn up by the Society's Fruit Committee, will also be issued in view of its bearing upon the future fruit interests of the country. It runs into nearly 200 pages, and its price is 2*s.* post free.

20. **Library.**—Further additions to the Lindley Library have been made. The Council particularly wish to thank the Family of the late

Sir Trevor Lawrence, our President, for the munificent gift of 172 volumes from his library.

21. **Treasurer.**—The Council were inexpressibly grieved by their sudden loss in March of Mr. J. Gurney Fowler who for the last eighteen years has been Treasurer of the Society. With what success he handled the Society's finances the annual balance sheets show. And not only in his office of Treasurer was he one of the mainstays of the Society's work, but as Chairman of the Orchid Committee he contributed greatly by his wide knowledge of Orchids to the deliberations of that Committee. The heavy work which fell upon him in connexion with the International Exhibition of 1912, and which no other man could have successfully accomplished, will always be a helpful incentive to those who come after.

Capt. and Hon. Major C. G. A. Nix, Member of Council and Chairman of the Fruit and Vegetable Committee, has accepted the Office of Treasurer as Mr. Gurney Fowler's successor. Major Nix is at present absent on Military duties, and in the interim Sir Harry J. Veitch, V.M.H., is acting Treasurer.

The Council are glad to be able to announce that Sir Jeremiah Colman, Bart., has consented to act as Chairman of the Orchid Committee.

22. **Vases.**—The difficulty of vases being taken away from the Hall, and the many breakages, coupled with the present insuperable difficulty of obtaining new vases, compel the Council, in the interest of exhibitors, to require a deposit at all exhibitions. This deposit will be refunded on the vases being returned to the Show Attendant. It will be necessary, therefore, for exhibitors to provide their assistants with vase money (1s. for a dozen or any less number) when sending them to prepare for an Exhibition.

23. **Economies.**—The usual List of Fellows will not be issued for the new year, but only a supplement to last year's list, containing the names of new Fellows. Those Fellows who have any knowledge of the shortage of paper and labour will perceive the necessity for every possible economy in this direction.

For somewhat similar reasons the Daffodil Year Book was not continued this year, but when conditions improve the Council hope to resume its publication.

Other economies include (1) the issue of only two Parts of the Journal instead of three; (2) the withdrawal of most of the Silver Cups from the Award Lists at Chelsea and Holland House—an economy which the exhibitors loyally accepted and for which the Council thank them; (3) the greatly reduced size of the tents at Chelsea and Holland House; and (4) the omission of the Holland House luncheon for the Committees and Judges. Also (5) the use of post-cards for all correspondence not involving personal matters; (6) the omission of Bands

at both the principal Shows ; and, lastly, (7) a much smaller staff and longer working hours.

24. **Gold Medals.**—In order to conform to the desire of the Government that the use of the metal of Gold should be as restricted as possible, the Council have decided not to strike any further Gold Medals until after the War. The Council are assured that the would-be recipients will be patriotically content with the Gold Medal *Card* until easier times may be reached.

25. **Obituary.**—It is with deep regret that the Council have to record the death of many Fellows, particularly the following :—Mr. J. Gurney Fowler previously referred to ; Elizabeth Lady Lawrence, who, with the late Sir Trevor Lawrence, Bart., was for so many years associated with the Society ; The Right Hon. Lord Redesdale, G.C.V.O., C.B., V.M.H., and Mr. N. N. Sherwood, V.M.H., past members of the Council and both important patrons of horticulture ; The Right Hon. Sir C. Clementi-Smith, G.C.M.G., Mr. Edward Mawley, V.M.H., President of the National Rose Society ; Dr. Robert Boxall ; and Messrs. W. Y. Baker, W. F. Cooling, F. G. Drew, F. Enock, R. H. Fremlin, Wm. Wells, John Wright, V.M.H., and George Wythes, V.M.H.

26. **New V.M.H.**—Owing to the death of two holders of the Victoria Medal of Honour quite at the close of 1915, coupled with the loss of others during the current year, the Council have appointed the following gentlemen to this honour, viz. :—Mr. E. A. Bowles, M.A., F.L.S. ; The Hon. Vicary Gibbs ; and Messrs. W. Slocock, Peter C. M. Veitch, and W. Watson.

27. **Numerical Position.**—The following table shows the Society's position with regard to numerical strength during the past year :—

LOSS BY DEATH IN 1916.

		£	s.	d.
Life Fellows	7	0	0	0
4 Guineas	2	8	8	0
2 ,,	60	126	0	0
1 ,,	74	77	14	0
Associate	1	0	10	6
	144	£212	12	6

LOSS BY RESIGNATION, &c.

		£	s.	d.
4 Guineas	0	0	0	0
2 ,,	296	621	12	0
1 ,,	415	435	15	0
Associates	13	6	16	6
Affiliated Societies	5	5	5	0
	729	£1,069	8	6
TOTAL LOSS	873	£1,282	1	0

FELLOWS ELECTED IN 1916.

		£	s.	d.
4 Guineas	6	25	4	0
2 ,,	351	737	2	0
1 ,,	424	445	4	0
Associates	47	24	13	6
Affiliated Societies	7	7	7	0
Commutations = £262 10s. 0d.	12			
	847	£1,239	10	6
Loss		1,282	1	0
NET DECREASE IN INCOME		£42	10	6

Deaths and Resignations	873
New Fellows	847
NUMERICAL LOSS	26
Total on December 31, 1915	13,937
Total on December 31, 1916	13,911

28. **Committees &c.**—The Society owes a constantly recurring debt to the Members of the Standing and Special Committees, Chairmen, Judges, Writers of Papers for the *Journal*, Compilers of Extracts, Reviewers, Lecturers, and the several Examiners, who, during the past twelve months, have done so much to contribute to the Society's national usefulness and to help to maintain its high standing among the practical and scientific institutions of the world.

The Council desire cordially to acknowledge their obligations to their staff and also to the Press for their invaluable assistance in reporting upon, and calling attention to, the work of the Society.

By Order of the Council,

W. WILKS,

Secretary.

ROYAL HORTICULTURAL SOCIETY,
VINCENT SQUARE, WESTMINSTER, S.W.
January 1, 1917.

Dr. **ANNUAL REVENUE & EXPENDITURE ACCOUNT**

	£ s. d.	£ s. d.
To ESTABLISHMENT EXPENSES—		
Ground Rent	690 0 0	
Rates and Taxes	642 8 4	
Water Rate	66 4 4	
Electric Light	60 2 11	
Gas	28 12 11	
		1,487 8 6
Salaries and Wages	2,260 12 11	
Printing and Stationery	1,415 16 11	
Postages	656 10 8	
Fuel	52 1 0	
Advertising	125 9 1	
Professional Fees	234 6 4	
Gratuities	70 0 0	
Repairs and Renewals (including £150 for Hall Painting)	323 13 1	
Miscellaneous Expenses	160 14 10	
		5,299 4 10
,, INSURANCES		131 7 5
,, JOURNAL, PRINTING AND POSTAGE		3,067 2 6
,, STAFF PENSION	329 11 9	
Less contributed by the Staff, as per scheme	133 18 9	
		195 13 0
,, SHOWS and MEETINGS—		
Chelsea Show	1,513 15 8	
Holland Park Show	1,104 2 1	
Autumn Vegetable and Fruit Show	375 3 9	
Labour, Floral Meetings and Conferences	194 11 4	
Expenses, do. do.	46 0 8	
* Council, Committee and Deputation Expenses	191 6 6	
Painting Orchid Certificates	28 10 0	
		3,513 10 0
,, INSPECTION OF GARDENS		7 16 4
,, PRIZES and MEDALS— Awarded at Society's Shows		268 13 1
,, EXAMINATIONS in HORTICULTURE—		
Amount expended	173 1 3	
Less received in Fees	108 17 6	
		64 3 9
,, CONTRIBUTION to LINDLEY LIBRARY—		
Purchase of Books	135 14 1	
Expenses	56 5 6	
		191 19 7
,, SPECIAL EXPENDITURE—		
Printing List of Certificated Orchids	115 8 0	
Special Circulars to Fellows	126 0 9	
Contribution to Forrest Account	103 18 4	
Trees, Shrubs, &c., sent to the Army in France	139 6 0	
Expenses connected with Red Cross Sale	14 0 0	
		498 13 1
,, DEPRECIATION— Hall Glass Roof, Furniture, Appliances for Shows		265 9 4
		14,991 1 5
,, BALANCE, carried to BALANCE SHEET		10,035 3 11
		£25,026 5 4

FOR YEAR ENDING 31st DECEMBER, 1916. Cr.

	£ s. d.	£ s. d.
By Annual Subscriptions		18,748 10 0
" Entrance Fees		143 17 0
" Dividends and Interest	1,876 15 1	
" do. do. Davis Trust	46 16 10	
		1,923 11 11
" Shows and Meetings—		
Chelsea Show	1,779 3 0	
Holland Park Show	663 13 0	
Takings at Hall Shows	87 0 5	
		2,529 16 5
" Journals and Other Publications—		
Advertisements	810 12 8	
Sale of Publications	516 2 6	
		1,326 15 2
" Hall Lettings	179 13 0	
Less Labour Expenses	37 17 2	
		141 15 10
" Prizes and Medals		92 12 0
" Life Compositions— Being amount paid by Fellows now deceased		57 15 0
" Rent of Cottages, Wisley		61 12 0
		£25,026 5 4

LIABILITIES.

		£ s. d.	£ s. d.
To Capital Funds Account—			
As at 31st December, 1915		46,174 7 0	
Less Fees paid by Fellows now deceased		57 15 0	
			46,116 12 0
,, Life Compositions, 1916			304 10 0
,, Sundry Creditors			2,526 9 1
,, Subscriptions, &c., paid in advance			240 1 6
,, Wisley Scholarships—			
Balance 31st December, 1915			5 4 2
,, Reserve Account—Hall Painting—			
Balance 31st December, 1915		673 13 4	
Added 1916		150 0 0	
			823 13 4
,, Depreciation and Renewals Reserve Account—			
Balance 31st December, 1915		2,477 2 2	
Added 1916		265 9 4	
			2,742 11 6
,, Laboratory Prize Fund—			
Balance 31st December, 1915	£4 2 11		
Dividend (Nicholson Memorial Fund)	5 16 9		
		9 19 8	
Less expended		5 9 6	
			4 10 2
,, Williams Memorial Fund			21 10 10
,, Masters Memorial Fund			29 4 4
,, Schröder Pension			7 11 8
,, Lindley Library Trust			10 0 0
,, Pritzel Revision Fund			88 5 1
,, General Revenue Account—			
Balance, 31st December, 1915		46,069 19 9	
Deduct—			
Capital Expenditure Wisley Gardens	8,045 2 3		
Bad Debts	9 18 3		
		8,055 0 6	
		38,014 19 3	
,, Revenue for the Year, as per annexed Account	£10,035 3 11		
Less Wisley Gardens, Excess of Expenditure over Revenue	4,759 19 3		
		5,275 4 8	
			43,290 3 11
			£96,210 7 7

31st DECEMBER, 1916. Cr.

ASSETS.

	£ s. d.	£ s. d.
By Capital Expenditure—		
" New Hall and Offices—		
As at 31st December, 1915 . . .	41,277 13 4	
" Furnishing Hall and Offices—		
As at 31st December, 1915 . . .	2,464 9 8	
" Freehold Land and Cottages at Wisley .	2,260 0 0	46,002 3 0
" Appliances for Shows		236 11 0
" Sundry Debtors and Payments made in Advance		1,611 8 11
" Woking Water Co.—		
Deposit in respect of laying water-mains from Ripley to Wisley Gardens		1,260 0 0
" Investment of Depreciation and Renewal and Reserve Account—		
3½ % India Stock £2,367 18 9 . . . cost	2,211 12 10	
2½ % Consols £449 19 9 . . . . "	265 9 4	2,477 2 2
" Investments, as per Schedule . . . at cost		42,852 10 6
(In common with most pre-war Securities the above have, for sale purposes, considerably depreciated, but for revenue purposes they bring in the same income as before.)		
" Cash—		
At Bank	215 0 5	
On Deposit	1,500 0 0	
In Hand	55 11 7	1,770 12 0
		£96,210 7 7

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on the 31st Dec., 1916.

ALFRED C. HARPER, *Auditor*
(Harper Brothers & Feather, *Chartered Accountants*),
35 Great Tower Street, London, E.C.

19th January, 1917.

Dr. **WISLEY GARDENS—ANNUAL REVENUE & EXPENDITURE**

	£ s. d.	£ s. d.	£ s. d.
To SALARIES—			
Garden		475 5 0	
Laboratory		1,448 0 10	
			1,923 5 10
,, RATES AND TAXES		197 1 9	
,, WATER RATE		51 18 9	
,, INSURANCES		66 14 6	
,, LABOUR		1,678 15 2	
,, GARDEN IMPLEMENTS		42 13 2	
,, LOAM AND MANURE		64 9 2	
,, REPAIRS		213 17 7	
,, FUEL		340 13 6	
,, MISCELLANEOUS EXPENSES—			
Garden	226 9 3		
Laboratory	237 1 3		
		463 10 6	
,, GRATUITIES		24 4 0	
,, CARTAGE		112 13 11	
,, TREES AND SHRUBS, AND ROCK GARDEN		12 8 8	
			3,269 0 8
,, COST OF GROWING, PACKING AND DISTRIBUTION OF PLANTS TO FELLOWS			269 16 7
,, STAFF PENSION		236 14 6	
Less contributed by the Staff, as per scheme		90 9 2	
			146 5 4
,, DEPRECIATION— Glass Houses, Plant and Materials			506 18 1
,, SPECIAL EXPENDITURE— Tithe Redemption			42 18 4
			£6,158 4 10

ACCOUNT FOR YEAR ENDING 31st DECEMBER, 1916. Cr.

	£ s. d.	£ s. d.
By DIVIDENDS AND INTEREST		1,053 0 11
„ PRODUCE SOLD		79 9 8
„ STUDENTS' FEES		15 15 0
„ EDUCATION GRANT—Wisley School . . .		250 0 0
„ BALANCE, being excess of Expenditure over Revenue		4,759 19 3
		£6,158 4 10

Dr. **WISLEY GARDENS—BALANCE**

LIABILITIES.

	£	s.	d.	£	s.	d.
To Capital Funds Account—						
As at 31st December, 1915	23,314	19	6			
Amount transferred from R. H. Society, 31st December, 1916	8,045	2	3			
Donations	0	2	6			
				31,360	4	3
„ Endowment Fund				25,000	0	0
„ Depreciation and Renewals—						
As at 31st December, 1915	3,171	1	3			
Added, 1916	340	3	6			
				3,511	4	9
				£59,871	9	0

ASSETS.

		£ s. d.	£ s. d.
By Dwelling Houses—			
As at 31st December, 1915	£5,651 17 4		
Expenditure since	155 9 5		
		5,807 6 9	
" Glass Houses, Ranges, Potting Shed, &c.—			
As at 31st December, 1915		5,202 6 0	
" Laboratory—			
As at 31st December, 1915	£11,344 16 2		
Expenditure since	7,447 19 4		
		18,792 15 6	
			29,802 8 3
N.B.—The Wisley Estates are, under the Trust Deed, vested in the Society only so long as it is in the position to use them as an Experimental Garden. The value of the expenditure thereon depends therefore on the continual use of the Garden by the Society.			
" Inventory of Plant and Loose Effects—			
As taken by Mr. Chittenden			1,202 11 0
" Motor Car		150 0 0	
Less Depreciation		50 0 0	
			100 0 0
" Library			255 5 0
			31,360 4 3
" Investment of Depreciation and Renewals Reserve Account, 31st December, 1915—			
£2,981 11*s.* 10*d.* 3½% India Stock cost	£2,772 7 0		
£675 8*s.* 3*d.* 2½% Consols cost	398 14 3		
		3,171 1 3	
Add Cash at Bank for Investment, 31st December, 1916		340 3 6	
			3,511 4 9
" Investments—			
Great Eastern Railway Company 4% Debenture Stock £3,500		3,535 0 0	
Leopoldina Railway Company, Ltd. 5% Terminable Debentures £2,000		2,000 0 0	
City of Moscow Loan 1912. 4½% Bonds £6,000		5,730 0 0	
Buenos Ayres Great Southern Railway Company 5% Non-Cumulative Preference Stock £2,500		2,825 0 0	
War Stock 4½% 1925-45. £5,000		5,000 0 0	
Canadian Pacific Railway Company 4% Perpetual Consolidated Debenture Stock, £4,632		3,890 17 6	
Consols 2½% £3,229 5*s.* 6*d.*		1,889 2 6	
London County Consolidated 3½% Stock £135 8*s.* 4*d.*		130 0 0	
			25,000 0 0
			£59,871 9 0

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position on the 31st Dec., 1916.

ALFRED C. HARPER, *Auditor*
(Harper Brothers & Feather, *Chartered Accountants*),
35 Great Tower Street, London, E.C.

19th January, 1917.

Dr.

ALFRED DAVIS

Bequeathed to the Society in 1870 for Annual Prizes,

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915	1,797 8 9	
,, Dividends received 1916		46 16 10

WILLIAMS

Raised by Donations in 1891 in Memory of

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915	204 2 5	
	204 2 5	
,, Balance 31st December, 1915		23 13 0
,, Dividends received 1916		7 12 10
		31 5 10

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915	542 17 0	
	542 17 0	
,, Balance 31st December, 1915		11 6 0
,, Dividends received 1916		17 18 4
		£29 4 4

NICHOLSON

Raised by Donations in 1908 in Memory of

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915	160 12 11	
,, Dividends received 1916		5 16 9

SCHRÖDER

Provided by Royal Horticultural Society in Memory of the late Baron

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915	557 14 6	
,, Balance 31st December, 1915		9 8 4
,, Dividends received, 1916		18 3 4
		27 11 8

TRUST FUND. Cr.

or in any other way the Council may determine.

		£ s. d.	£ s. d.
By Consols, £2,022 8s. 9d.	cost	1,797 8 9	
,, Revenue and Expenditure Account . . .			46 16 10

MEMORIAL FUND.

B. S. Williams towards Prizes and Medals.

	£ s. d.	£ s. d.
By East India Railway Co. Annuity, Class B £7 .	168 0 0	
,, New South Wales Government 4 per cent. Inscribed Stock (1942–62) £36 3s. 1d. . . .	36 2 5	
	204 2 5	
,, Expense of Dies		9 15 0
,, Balance in hands of R. H. Society . . .		21 10 10
		31 5 10

MEMORIAL FUND.

towards the Provision of one or more Annual Lectures.

	£ s. d.	£ s. d.
By Midland Railway Consolidated 2½ per cent. Perpetual Preference Stock £400 . . .	290 13 6	
,, Midland Railway Consolidated 2½ per cent. Perpetual Guaranteed Preferential Stock £400	252 3 6	
	542 17 0	
,, Balance in hands of R. H. Society . . .		29 4 4
		£29 4 4

MEMORIAL FUND.

George Nicholson for Prizes to Wisley Students.

	£ s. d.	£ s. d.
By Tasmanian Government 4 per cent. Inscribed Stock (1940–50), £162 4s. 5d. . . .	160 12 11	
,, Transfer to Wisley Prize Fund . . .		5 16 9

PENSION.

Schröder to pay to Gardeners' Royal Benevolent Institution for one Pension.

	£ s. d.	£ s. d.
By Great Western Railway 4 per cent. Debenture Stock £500.	557 14 6	
,, Gardeners' Royal Benevolent Institution . .		20 0 0
,, Balance in hands of R. H. Society . . .		7 11 8
		27 11 8

Dr. **LINDLEY LIBRARY**

	£ s. d.	£ s. d.
To Amount of Fund 31st December, 1915.	6,063 3 6	
„ Contribution from R. H. Society, 31st December, 1916	135 14 1	
	6,198 17 7	
To Balance 31st December, 1915		8 12 6
„ Dividends and Donations received 1916		46 10 5
„ Contribution from R. H. Society, 31st December, 1916		56 5 6
		111 8 6

PRITZEL REVISION

Fund to be raised for the Revision of Pritzel's Iconum

	£ s. d.	£ s. d.
To Amount of Fund, 31st December, 1915.	850 2 2	
„ Balance, 31st December, 1915		56 17 6
„ Dividends received, 1916		31 7 7
		88 5 1

TRUST.

Cr.

	£	s.	d.	£	s.	d.
By Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock £1,516 held by the Charity Commissioners . . .	1,458	15	7			
" Value of Library, 31st December, 1915 . .	4,604	7	11			
" Purchase of Books, 1916 (*See* Report) . .	135	14	1			
	6,198	17	7			
By Librarian's Salary				100	0	0
" Printing				1	8	6
" Balance in hands of R. H. Society . . .				10	0	0
				111	8	6

FUND.

Botanicarum Index. Estimated cost, £3.000.

	£	s.	d.	£	s.	d.
By India 2½ per cent. Stock, £1,367 13 6 . .	850	2	2			
" Balance in hands of R. H. Society . . .				88	5	1
				88	5	1

SCHEDULE OF INVESTMENTS.

31st December, 1916.

			£	s.	d.
2½ %	Consols, £5,324 19s. 8d.	*cost*	5,081	6	2
3 %	Local Loans, £5,800	,,	6,006	16	5
3½ %	Indian Rupee Paper, 37,000 Rupees	,,	2,462	14	4
3½ %	Dominion of Canada Registered Stock (1930–1950), £2,000	,,	2,000	0	0
3½ %	London County Consolidated Stock, £2,864 11s. 8d.	,,	2,884	6	10
3½ %	India Stock £2,063 4s.	,,	2,024	10	4
5 %	Havana Terminal Railroad Company Mortgage Debenture Bonds £8,300	,,	8,946	0	0
4½ %	Central Argentine Railway, Limited, Consolidated Preference Stock £2,800	,,	2,907	3	5
5 %	State of San Paulo Treasury Bonds (1913) £5,000	,,	4,897	13	0
4 %	Central Argentine Railway, Limited, Debenture Stock, £600	,,	537	15	10
2½ %	India Stock, £186 9s.	,,	109	2	2
4 %	Mortgage on Freehold £1,000	,,	1,000	0	0
4½ %	War Stock (1925–1945), £2,000	,,	1,995	2	0
5 %	Exchequer Bonds, £2,000	,,	2,000	0	0
			£42,852	10	6

GENERAL MEETING.

FEBRUARY 27, 1917.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair.

Fellows elected (16).—Lady Beaverbrook, R. W. Beeston, J. P. Bland, Albert Braithwaite, Mrs. Jane Dodds, Miss S. Forssman, C. A. Heron, John Hilton, Miss D. Leeper, Miss E. M. Marindin, Mrs. G. Milne, T. N. Roberts, W. W. Roberts, J. E. Sarjeant, G. C. Shambrook, F. Stacey.

Affiliated Society.—The Cefn Forest and District Horticultural Society. *Union of Horticultural Mutual Improvement Society,* Leadgate, Iveston, and District Amateur Gardening Association.

A lecture was given by Mr. John Dickson on "The Herbaceous Border" (see p. 1).

GENERAL MEETING.

MARCH 13, 1917.

Rev. J. JACOB in the Chair.

Fellows elected (18).—W. Baskin, Mrs. R. Bernard, G. F. Britton, Stanley Clifton, F. Clipstone, R. G. Crittall, R. E. Dinn, J. Duffy, W. M. M. Forwood, W. R. K. Gandell, Denis Hannigan, H. Hassall, J. S. Haycraft, M. B. F. Major, R. W. May, Miss E. V. Pale, E. L. Vaughan, M.A., E. B. Wood.

Fellows resident abroad (1).—Arthur J. F. Gibbons (Guernsey).

Associate (1).—G. E. Kitchen.

A lecture on "The Cultivation of Vegetables" was given by Mr. Edwin Beckett, V.M.H. (see p. 5).

GENERAL MEETING.

MARCH 27, 1917.

Mr. E. H. JENKINS, F.R.H.S., in the Chair.

Fellows elected (22).—J. Ansaldo, Alexander Brown, Major Carleton, W. G. Darrington, E. G. Davies, A. B. Dobell, C. Jermyn Ford, Mrs. Halford, W. J. Hande, Miss Hansford, Mrs. E. M. Hart, A. N. Hunter, C. W. Johnson, Mrs. Kershaw, E. J. A. Lant, Mrs. H. P. Martin, S. McLean May, W. Mills, Jonathan Morgan, Mrs. H. Parsons, W. Van Eyk, A. F. O. Wallbrook.

Associates (2).—John Craven, Miss R. Ricardo.

A lecture was given by Mr. J. C. House on "Violets and their Cultivation" (see p. 16).

GENERAL MEETING.

April 11, 1917.

Mr. James Hudson, V.M.H., in the Chair.

Fellows elected (18).—Mrs. Hugh Adams, C. J. Alexander, Herbert Barber, H. E. Boardman, Mrs. P. Bonjuta, Sigurd Borjesen, R. S. Brown, Thomas Cadogan, I. W. Fletcher, W. F. Gullick, Hugh Highgate, H. P. Martin, M. E. Mills, Miss J. S. Oliver, R. C. Reed, J. S. Skinner, the Hon. Katherine Thring, Miss G. S. Wilbee.

Fellows resident abroad (2).—Capt. A. N. John (Punjab), Rev. A. H. Scott (Canada).

Associate (1).—Alice P. Craig.

Affiliated Society (1).—I. M. M. Horticultural Society.

A lecture was given by Mr. E. A. Bunyard, F.L.S., on "Increasing the Home Fruit Supply" (see p. 23).

GENERAL MEETING.

April 24, 1917.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair.

Fellows elected (8).—W. H. Beaumont, J. W. Cartner, Mrs. Dick, Major W. F. Dick, Miss L. Earnshaw, G. R. Groom, J. E. Spencer, T. C. Williamson.

Associate (1).—Miss Margaret V. Snow.

Affiliated Society (1).—Tisbury District Horticultural Society.

A lecture was given by Mr. R. Farrer, J.P., on "The Southern Kansu Marches of Tibet," 1916.

GENERAL MEETING.

May 8, 1917.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair.

Fellows elected (13).—Miss M. Battiscombe, L. W. Dixon, Major-Gen. G. G. A. Egerton, Viscountess Galway, Mrs. Ruth Gow, R. A. Hatton, G. Hooper, Mrs. Hull, H. Leetham, D. E. Mee, R. Phillips, G. R. J. Rumbol, Mrs. A. W. Tait.

Associates (2).—A. J. Elgar, C. H. Wheeler.

A lecture was given by Mr. R. Farrer, J.P., on "The Northern Kansu Marches of Tibet," 1916.

GENERAL MEETING.

MAY 22, 1917.

Mr. F. J. HANBURY, F.L.S., in the Chair.

Fellows elected (19).—Hon. Mrs. R. Beckett, Mrs. Alfred Bell, J. Brough, 2nd Lieut. J. Codrington, Mrs. O'Cory, Brigadier-Gen. A. H. Cowie, Lieut.-Col. A. Fletcher, Mrs. M. Harris, C. R. Hill, E. Jacobs, S. J. Johnson, Mrs. A. L. Johnson, C. E. Kennedy, Mrs. E. M. Lambert, V. Murray, H. E. Paling, H. M. Taylor, W. C. Towle, Mrs. A. D. Wheatley.

Resident abroad (1).—I. H. Burkhill (Singapore).

Societies Affiliated (1).—Fort Dunlop Gardens Association.

A lecture on "Snowdrops" was given by Mr. E. A. Bowles, M.A., V.M.H. (see p. 28).

GENERAL MEETING.

JUNE 5, 1917.

Mr. W. A. BILNEY, J.P., in the Chair.

Fellows elected (16).—G. A. Apcar, Mrs. Barclay-Brown, Miss M. Dunlop, Samuel Ewins, William Garwood, L. Kinns, Lady Lyon, T. Pank, D. F. Pullar, John Roscoe, L. Scott, Miss M. Shaw, F. S. Smith, A. C. Thrupp, Miss M. Tuke, Mrs. A. A. Yarrow.

Associate (1).—Miss Garwood.

A lecture by Mr. Amos Perry on "Delphiniums" was read by the Chairman.

GENERAL MEETING.

JUNE 19, 1917.

Sir J. T. DILLWYN LLEWELYN, Bt., V.M.H., in the Chair.

Fellows elected (15).—F. W. Birkinshaw, William Coad, Mrs. Durie, Mrs. E. Haydon, G. S. Heath, J. Heyes, S. Hill-Jones, A. J. Jennings, G. Jenkins, A. H. Kersey, Miss A. Major, A. Robinson, G. Rogers, Mrs. Thursley, E. W. Tickle.

Societies Affiliated (6).—Beaconsfield and District Produce Society, Cwmbach Horticultural Society, Dunstable Allotment Holders' Association, Handsworth Allotment and Garden Holders' Association, Hull Garden Village Horticultural Society, Raynes Park District Horticultural Society.

A lecture on "Border Carnations" was given by Mr. J. Douglas (see p. 43).

GENERAL MEETING.

April 11, 1917.

Mr. James Hudson, V.M.H., in the Chair.

Fellows elected (18).—Mrs. Hugh Adams, C. J. Alexander, Herbert Barber, H. E. Boardman, Mrs. P. Bonjuta, Sigurd Borjesen, R. S. Brown, Thomas Cadogan, I. W. Fletcher, W. F. Gullick, Hugh Highgate, H. P. Martin, M. E. Mills, Miss J. S. Oliver, R. C. Reed, J. S. Skinner, the Hon. Katherine Thring, Miss G. S. Wilbee.

Fellows resident abroad (2).—Capt. A. N. John (Punjab), Rev. A. H. Scott (Canada).

Associate (1).—Alice P. Craig.

Affiliated Society (1).—I. M. M. Horticultural Society.

A lecture was given by Mr. E. A. Bunyard, F.L.S., on "Increasing the Home Fruit Supply" (see p. 23).

GENERAL MEETING.

April 24, 1917.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair.

Fellows elected (8).—W. H. Beaumont, J. W. Cartner, Mrs. Dick, Major W. F. Dick, Miss L. Earnshaw, G. R. Groom, J. E. Spencer, T. C. Williamson.

Associate (1).—Miss Margaret V. Snow.

Affiliated Society (1).—Tisbury District Horticultural Society.

A lecture was given by Mr. R. Farrer, J.P., on "The Southern Kansu Marches of Tibet," 1916.

GENERAL MEETING.

May 8, 1917.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair.

Fellows elected (13).—Miss M. Battiscombe, L. W. Dixon, Major-Gen. G. G. A. Egerton, Viscountess Galway, Mrs. Ruth Gow, R. A. Hatton, G. Hooper, Mrs. Hull, H. Leetham, D. E. Mee, R. Phillips, G. R. J. Rumbol, Mrs. A. W. Tait.

Associates (2).—A. J. Elgar, C. H. Wheeler.

A lecture was given by Mr. R. Farrer, J.P., on "The Northern Kansu Marches of Tibet," 1916.

GENERAL MEETING.

MAY 22, 1917.

Mr. F. J. HANBURY, F.L.S., in the Chair.

Fellows elected (19).—Hon. Mrs. R. Beckett, Mrs. Alfred Bell, J. Brough, 2nd Lieut. J. Codrington, Mrs. O'Cory, Brigadier-Gen. A. H. Cowie, Lieut.-Col. A. Fletcher, Mrs. M. Harris, C. R. Hill, E. Jacobs, S. J. Johnson, Mrs. A. L. Johnson, C. E. Kennedy, Mrs. E. M. Lambert, V. Murray, H. E. Paling, H. M. Taylor, W. C. Towle, Mrs. A. D. Wheatley.

Resident abroad (1).—I. H. Burkhill (Singapore).

Societies Affiliated (1).—Fort Dunlop Gardens Association.

A lecture on "Snowdrops" was given by Mr. E. A. Bowles, M.A., V.M.H. (see p. 28).

GENERAL MEETING.

JUNE 5, 1917.

Mr. W. A. BILNEY, J.P., in the Chair.

Fellows elected (16).—G. A. Apcar, Mrs. Barclay-Brown, Miss M. Dunlop, Samuel Ewins, William Garwood, L. Kinns, Lady Lyon, T. Pank, D. F. Pullar, John Roscoe, L. Scott, Miss M. Shaw, F. S. Smith, A. C. Thrupp, Miss M. Tuke, Mrs. A. A. Yarrow.

Associate (1).—Miss Garwood.

A lecture by Mr. Amos Perry on "Delphiniums" was read by the Chairman.

GENERAL MEETING.

JUNE 19, 1917.

Sir J. T. DILLWYN LLEWELYN, Bt., V.M.H., in the Chair.

Fellows elected (15).—F. W. Birkinshaw, William Coad, Mrs. Durie, Mrs. E. Haydon, G. S. Heath, J. Heyes, S. Hill-Jones, A. J. Jennings, G. Jenkins, A. H. Kersey, Miss A. Major, A. Robinson, G. Rogers, Mrs. Thursley, E. W. Tickle.

Societies Affiliated (6).—Beaconsfield and District Produce Society, Cwmbach Horticultural Society, Dunstable Allotment Holders' Association, Handsworth Allotment and Garden Holders' Association, Hull Garden Village Horticultural Society, Raynes Park District Horticultural Society.

A lecture on "Border Carnations" was given by Mr. J. Douglas (see p. 43).

SCIENTIFIC COMMITTEE.

JANUARY 16, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and three members present.

The only business before the Committee was a letter from Mr. J. Douglas referring to the article in *The Garden* on *Dianthus* × *Allwoodii*. The Committee desired that it should be pointed out that the Certificate of Appreciation was awarded to Mr. Allwood for his work in raising the forms which he exhibited, not to the plant, and that the name was applied to the whole of the hybrids between the Pink and the Carnation, to which cross no name had hitherto been given.

SCIENTIFIC COMMITTEE, JANUARY 30, 1917.

Mr. E. A. BOWLES, M.A., in the Chair, and four members present.

Galanthus Elwesii var. *Whittallii.*—Mr. Bowles said he had examined a Snowdrop sent by Mr. Chapman and found it to be a form of *G. Elwesii* with very wide inner segments, so wide that they overlapped considerably at the edges, giving an almost semi-double appearance to the flower.

Narcissus cyclamineus hybrid.—Mr. Bowles also showed a Narcissus seedling from *N. cyclamineus*, but with broader leaves, paler corona, and very pale segments. The greenish inflated spathe suggested *N. praecox* as one of the parents.

'*Wood Flower.*'—Mr. W. C. Worsdell, F.L.S., showed a piece of a branch upon which a species of Phoradendron had been growing. It showed the remarkable grooved expansion produced by the growth of the parasite, which has almost the form of a flower (giving rise to the common name). It came from the Argentine.

SCIENTIFIC COMMITTEE, FEBRUARY 13, 1917.

Sir EVERARD IM THURN in the Chair, and six members present.

Tulipa Kaufmanniana.—Mr. J. H. Chapman exhibited flowering plants of *Tulipa Kaufmanniana*, a species introduced to cultivation about 1877 and awarded F.C.C. 1897. The plants shown were dwarf, bright rose on the back of the exterior segments, yellow at base inside, with a carmine spot about midway down the segments inside, and margined with pale cream or white. They were thus somewhat different from the form certificated and from those figured in

The Garden and the *Botanical Magazine,* and were, further, easy to propagate, which some forms of this species are not. The whole of Mr. Chapman's stock had been derived from one bulb.

Stipules of Hawthorn.—Mr. W. C. Worsdell, F.L.S., showed specimens of leaves from *Crataegus sinaica,* showing intermediate steps from leaf segments to so-called stipules and demonstrating that the latter belonged to the leaf-blade, not to the leaf-base, as true stipules do.

Leaves of Hybrid Orchids.—Mr. J. Ramsbottom, M.A., exhibited a series of slides showing the characters of leaves of hybrid Orchids. The series included sections of the leaves of thirteen primary hybrids and their parents :—

♀		Hybrid.
Cochlioda Noezliana	× *Ada aurantiaca*	(*Adioda*).
C. Noezliana	× *Miltonia vexillaria*	(*Miltonioda* × *Harwoodii*).
C. Noezliana	× *Odontoglossum cordatum*	(*Odiontioda* × *Craveniana*).
C. Noezliana	× *O. Harryanum*	(*Odontioda* × *Charlesworthii*).
C. Noezliana	× *Oncidium incurvum*	(*Oncidioda* × *Charlesworthii*).
C. Noezliana	× *O. macranthum*	(*Oncidioda* × *Cooksoniae*).
Laelia cinnabarina	× *Epidendrum prismatocarpum*	(*Epilaelia*).
L. tenebrosa	× *E. prismatocarpum*	(*Epilaelia*).
Odontoglossum Edwardii	× *Cochlioda vulcanica.*	
O. Edwardii	× *Rossii*	(*O.* × 'Antiope').
O. Uro-Skinneri	× *Miltonia Schroederiana.*	
O. Uro-Skinneri	× *O. Edwardii*	(*O. Grogoniae*).
Vanda teres	× *V. suavis.*	

Also two secondary hybrids :—

Odontioda × *Charlesworthii*	× *Odontoglossum Harryanum*	(*Odontioda Brewii*).
Odontoglossum Uro-Skinneri	× *Odontioda* × *Charlesworthii*	(*Odontioda* 'Irene').

They had been prepared by Mr. Charlesworth, who was studying the structure of hybrid Orchids, and it was found that where a structure existed in both parents, but developed to different degrees in them, the hybrid usually showed the same structure developed in an intermediate fashion ; when a structure was present in only one of the parents it might or might not be present in the hybrid, and if present was usually less well developed than in the parent possessing the character.

A Large Rhododendron.—Sir Everard im Thurn exhibited photographs of a tree of *Rhododendron arboreum,* growing in the rain forest of Ceylon, to call attention to the huge size of its trunks—of which there were several—each almost as large as a man's body, and showing great burrs and twists freely developed along them (fig. 34).

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The Action of Light in Inducing Variation.—Col. H. E. Rawson stated that "by the method of selective screening which he adopts with plants the coloured diffraction bands due to interference at any opaque edge are entirely transformed or their saturation modified. With the aid of a prism this is perceptible on every organ down to the finest filaments, and in the case of even minutely serrated edges of leaves. In considering changes in the intensity of light at different altitudes of the sun such modification should not be overlooked. The importance of this observation will be evident" to those who believe that the changes in the Tropaeolum which Col. Rawson has exhibited from time to time are the result of a response to changes in light intensity.

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Fasciated Rose.—Mr. J. Fraser, F.L.S., showed shoots of a Rose very much fasciated towards the top, and, as often happens, cylindrical at the base.

Chlorosis in Fagus sylvatica.—He also exhibited shoots of Beech which he had collected on a chalk hill in which all the leaves were yellow, and remarked upon the frequency of the occurrence of chlorosis in plants growing in chalky soil. The disease appears to be due to insufficiency of iron, and is usually curable by the addition of iron sulphate to the soil.

Apple Bark Splitting.—Mr. F. J. Baker, A.R.C.S., showed specimens of Apple shoots in which, during the past winter, longitudinal splits in the bark had appeared. The splitting has occurred in many places, and is probably due to severe frosts. The branches exhibited had evidently been taken from trees growing in a wet soil.

Scientific Committee, April 24, 1917.

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Forms of Agrostis alba.—Mr. J. Fraser, F.L.S., showed a series of specimens of forms of *Agrostis alba* from various localities, illustrating the wide range of variation which this species exhibits in its range from seashore to wet pasture lands.

Primula stenocalyx.—Mr. Bowles showed specimens of the two forms of this Chinese species, the one with, the other without, scent. Mr. Farrer has given an account of the two in his report of his Chinese journeys. He also showed flowers of the form called *Primula Loczii*, nearly related to *P. farinosa*, but forming stolons and several plants around the parent one.

American Gooseberry Mildew.—The following note on observations made by Mrs. E. V. Horne at the R.H.S. Laboratory at Wisley on the effect of Burgundy mixture on the winter fruits of the American Gooseberry mildew was read:—

"During the late autumn and winter I collected and examined a large number of twigs from Gooseberry bushes affected with the American Gooseberry mildew at Wisley, which had been sprayed with Burgundy mixture by Dr. Horne in July 1916, with the object of discovering whether the spraying had destroyed the vitality of the perithecia (winter fruits).

"Spraying was done after mature winter fruits had formed on a large number of the twigs. Prior to the spraying, several twigs

FIG. 34.—RHODODENDRON ARBOREUM IN A CEYLON FOREST. [*To face p.* xxxii.

FIG. 35.—PERENNIAL ASTER (N.B.) 'J. S. BAKER' (*Bakers*).

were labelled, viz.: (1) Twigs without mildew; (2) twigs with white mildew only, perithecia not formed; (3) twigs with mature perithecia.

"The results were as follows:

"1. Twigs not mildewed at the time of spraying: No mildew subsequently appeared.

"2. Twigs with white mildew, but no perithecia at the time of spraying: No perithecia were subsequently observed, with the exception of a very few young ones in a few cases, probably present at the time of spraying. The contents of these were shrivelled.

"3. Twigs with mature perithecia present at the time of spraying: The perithecia contained shrivelled asci and shrivelled ascospores, or ascospores which, when immersed in water or dilute sugar solution and pressed out of the perithecia, burst within a few seconds. The ascospores were not discharged naturally and failed to germinate.

"The perithecia from unsprayed bushes, used as a control, discharged perfectly healthy asci and ascospores, which did not burst when immersed in sugar solution, but sometimes burst in water after the lapse of a comparatively long period. Ascospores were discharged from these perithecia and collected on cover-glasses arranged at a distance of one quarter of an inch to over two inches from the perithecia. On several occasions the ascospores germinated, producing a short germ tube. Unsprayed twigs from other localities yielded similar results.

"Twigs sent for examination from a locality where the operator admitted that the bushes were sprayed with a mixture incorrectly prepared yielded a large proportion of perithecia capable of ejecting spores.

"The ejection of ascospores has been observed in December, January, March, and April.

"From these results it is evident that spraying with Burgundy mixture was effective, not only in preventing the appearance of mildew, but also in destroying it when present, whether in an early or in an advanced stage in its life-history."

The mixtures used were:

Copper sulphate	9¾ oz.
Sodium carbonate (washing-soda) .	11 oz.
Soap powder	6 oz.
Water	6 gallons

and

Copper sulphate	9¾ oz.
Sodium carbonate (washing-soda) .	11 oz.
Soap powder	12 oz.
Water	12 gallons.

SCIENTIFIC COMMITTEE, MAY 8, 1917.

Mr. H. J. ELWES, F.R.S., V.M.H., in the Chair, with eight members present and Mr. R. Farrer (visitor).

Prunus spinosa forms.—Mr. J. Fraser, F.L.S., showed dried specimens of a number of forms of *Prunus spinosa*, including the variety *macrocarpa*, which he regarded as a hybrid between *P. spinosa* and *P. communis*.

Narcissi.—Mr. Bowles showed flowers of the uncommon *Narcissus dubius* and the rare white form of *N. muticus*, which seems so difficult to grow and establish in this country.

Various Plants.—Mr. Elwes showed *Iris Wattii* grown in a cold house, where, like *I. fimbriata*, it succeeds much better than outdoors, good growth being apparently necessary before a good flowering spike can be developed; *Fritillaria gracilis*, which Mr. Bowles introduced from Montenegro; *Habranthus pratensis*; *Alpinia Elwesii*, from Formosa; *Arundina bambusaefolia*, from India, an Orchid rarely grown well now; *Rehmannia elatior* and *R. Henryi*, both cold-house plants; and *Cymbidium devoniensis*.

SCIENTIFIC COMMITTEE, MAY 22, 1917.

Dr. A. B. RENDLE, F.R.S., in the Chair, and eight members present.

Gall on Rhododendron ferrugineum.—Mr. W. C. Worsdell, F.L.S., showed specimens of the well-known gall on *Rhododendron ferrugineum*, due to the attack of the fungus *Exobasidium Rhododendri*. This gall usually occurs on the leaves, but in one case on the plants shown it was on the corolla.

Varieties of Pyrus Aria.—Mr. J. Fraser, F.L.S., showed specimens and commented upon the forms of *Pyrus Aria* which he had collected from wild sources in Surrey. Among them was one approaching the variety *salicifolia*, and another of the variety *majestica*. The latter is particularly interesting, for it is the form known as the Nepaul Service tree, or *Pyrus Aria nepalensis* (though it is not known to occur in Nepaul), and is generally assumed to have originated in nursery grounds.

Alteration in foliage of Tropaeolum.—Col. H. E. Rawson exhibited a plant of *Tropaeolum tuberosum* to show what he considered to be the sun's influence in causing the leaves to divide, as they normally do, into any number up to five lobes. He said "The division has been observed taking place at critical altitudes of the sun, which confirmed previous years' observations. Prior to the leaf dividing, precipitation is seen to take place from the margin inwards, which indicated the exact vein affected. This precipitation, which is reversible, I associate with the starch of the tuberous plant considered to be a colloidal phenomenon."

Tetramerous flowers of Narcissus.—From two sources came tetra-

merous flowers of Narcissi; in each case there were eight perianth pieces, eight stamens, and four carpels. The tetramerous condition of these flowers seems, therefore, not uncommon, and it is not rare in nearly allied plants.

Scientific Committee, June 5, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Many-flowered Tulips.—Mr. W. C. Worsdell, F.L.S., remarked upon the branched Tulips shown at the previous meeting, which are common especially among Darwin varieties in many gardens, that the many-flowered condition arose from adnation of branches, not from fasciation, as might appear probable from the external characters of the growths. He drew attention to the occurrence of branching in some species, as in *Tulipa biflora*, *T. saxatilis*, and *T. praestans*, and Mr. Bowles remarked that it seemed to be a primitive condition.

Cup-shaped Leaves.—Mr. J. Fraser, F.L.S., showed a "blind" Cauliflower in which a leaf had assumed the form of a cup. This is not uncommon in Cauliflowers, and is associated with the occurrence of a leaf at the tip of a shoot where it takes the place of a terminal bud. Mr. Anstis sent a similar growth in Aucuba from his garden at Birmingham, where the two opposite leaves formed a cylinder nearly 2 inches long before their free parts were reached.

Pyrus torminalis &c.—Mr. J. Fraser showed a series of specimens which he had collected in various localities, mostly on the Surrey downs, of *Pyrus torminalis*, *P. intermedia*, and *P. latifolia*. He and other members of the Committee remarked upon the possible hybrid origin of *P. latifolia* and *P. intermedia*, and the possibility that birds had carried the seeds of some of the forms from neighbouring gardens to apparently wild localities, where Mr. Fraser had found the trees growing.

Various Plants.—Mr. H. J. Elwes, F.R.S., showed a series of plants from his garden, including *Paeonia Emodi*, *P. albiflora*, *P. Broteri*, from Portugal, a bright, light form of *P. lobata* (a variety of *P. officinalis*), and *Polygonatum verticillatum*, which he had collected many years ago in Perthshire. He also showed a large, dark form of Camassia, probably a seedling from *C. Leichtlinii*.

Scientific Committee, June 19, 1917.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with nine members present, and Mr. R. Farrer (visitor).

Pine Rust.—Mr. A. D. Cotton showed specimens of Pine blister rust on *Pinus Strobus* from Haslemere. This disease is due to the fungus *Cronartium Ribicola*, and has its alternate stage on Black Currant or some other species of Ribes, occurring at times on the

Red Currant, and rarely, in this country, on the Gooseberry. It has occurred on the Gooseberry at Oxford.

Potato Spraying.—Some discussion took place with regard to the relative values of Bordeaux and Burgundy mixtures for spraying Potatos. In the former quick-lime is required, in the latter washing-soda; usually washing-soda is of more constant composition than quick-lime, and the spray is therefore easier to make. In both cases the more dilute the two materials to be mixed before the mixture is made the better, and in both cases also the mixing should be done immediately before the spray is used. The experimental spraying in Ireland during the past few years, as well as other experiments, shows that the 1 per cent. Burgundy mixture is an excellent and safe preventive of the disease caused by *Phytophthora infestans.* The proportions of the materials used are 4 lb. copper sulphate, 5 lb. washing-soda, and 40 gallons of water.

Various Plants.—Mr. Bowles showed, on behalf of Mr. Elwes, *Orchis foliosa,* a fine-flowered form of *O. latifolia, O. incarnata, Arisaema concinna* (from Himalaya and the Tibet border), a smaller ♀ plant of a species of *Arisaema, Polygonatum* with a foliaceous inflorescence which is constantly produced, and *Roscoea* (*Cautleya*) *lutea,* a hardy plant from the Himalaya belonging to the Scitamineae. He also showed from Miss Willmott's garden at Warley the uncommon *Iris Sintenisii* from Asia Minor; from his own at Waltham Cross *Meconopsis latifolia,* the semi-double form; blue and white forms of *Campanula patula,* and a form with six petals; a pale-blue form of Ranunculus, and the uncommon *Centranthus angustifolius,* which he had collected at Lautaret.

Hybrid Mints.—Mr. J. Fraser, F.L.S., showed a hybrid of *Mentha rotundifolia* × *viridis* which had been collected near Swanage; it was nearer to *rotundifolia* than to its other parent.

Hail: Effect on Onions.—Mr. Fraser also drew attention to the effect of hail upon Onions, the leaves of which show white bruises caused by recent hailstorms.

Xyleborus dispar in Sycamore.—Mr. Cheal sent specimens of the common Sycamore, *Acer Pseudoplatanus,* from the Crawley district, bored by the shot-hole borer, *Xyleborus dispar,* and containing the larvæ of the beetle in great numbers. This pest also attacks fruit-trees, including Plums, Pears, and Apples, and is a difficult one to deal with, the complete destruction of infested trees being probably the best course to pursue.

Effect of Salt Water.—Dr. Voelcker sent a note upon a case of scorching of Peaches and Vines, where, the supply from a well having given out, water from a lake had been used; the analysis of the lake water showed no less than 162½ grains of salts to the gallon, magnesia being present also, and suggested the infiltration of sea water. The well water contained only 8 grains of salts to the gallon.

Populus lasiocarpa.—Mr. J. C. Allgrove showed a fruiting specimen of this fine tree from Langley.

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 16, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Cheal, Crawley, for Apples.

Cultural Commendation.

To Mr. E. Beckett, V.M.H., Elstree, for Tomatos ' Early Sunrise and ' Golden Sunrise.'

The awards recommended by the Sub-Committee at Wisley to Celery and Celeriac on December 14, 1916, were confirmed.

CELERIAC.

Highly Commended.

12, ' Delicatesse ' (Barr) ; 15, ' Late Summer ' (Barr) ; 3, ' Ordinary Type ' (Sydenham) ; 1, ' Selected ' (Sutton).

CELERY.

Award of Merit.

30, 31, ' Clayworth Prize Pink ' (Sydenham, Hurst) ; 11, ' Invincible White ' (Dobbie).

Highly Commended.

6, ' Early Rose ' (Hurst) ; 49, ' Incomparable Crimson ' (Carter) ; 26, ' Matchless Pink ' (A. Dickson).

For descriptions of the above see Reports of Wisley Trials (pp. 107, 109).

Other Exhibits.

Mr. E. Beckett, V.M.H., Elstree : Onion ' Autumn Triumph.'
Messrs. Bunyard, Maidstone : Apple ' Orleans Reinette.'
Mr. W. H. Divers, V.M.H., Grantham : Apples.
Messrs. Sutton, Reading : vegetables.

FRUIT AND VEGETABLE COMMITTEE, JANUARY 30, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and six members present.

No awards were recommended on this occasion.

Exhibit.

Messrs. Seabrook, Chelmsford : Apple ' Monarch.'

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 13, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and fifteen members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Cheal, Crawley, for Apples.

It was proposed, seconded, and carried unanimously that a letter of condolence be sent on behalf of the Fruit and Vegetable Committee to the family of the late Mr. Charles Ross, V.M.H.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 27, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

The following awards were recommended to Savoy Cabbages after trial at Wisley :

Award of Merit.

18, Green Curled (Messrs. Dobbie) ; 44, Late Drumhead (Messrs. Nutting) ; 25, New Year (Messrs. Sutton) ; 41, Ormskirk Late Green (Messrs. Sydenham) ; 43, Ormskirk Hawlmark Selection (Messrs. A. Dickson) ; 42, Ormskirk (Messrs. Nutting).

For descriptions see Reports of Trials at Wisley (vol. xlii. p. 407).

Other Exhibits.

Messrs. Bunyard, Maidstone : Apple 'Sir John Thornycroft.'
Messrs. Cheal, Crawley : Apples.

FRUIT AND VEGETABLE COMMITTEE, MARCH 13, 1917.

Rev. W. WILKS, M.A., V.M.H., in the Chair, and twelve members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Seabrook, Chelmsford, for Apples.

Other Exhibits.

Mr. E. Beckett, V.M.H., Elstree : Onion 'Autumn Triumph.'
Mr. C. Dixon, Kensington : Pear 'Beurré Rance.'

FRUIT AND VEGETABLE COMMITTEE, MARCH 27, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. G. Bunyard, Maidstone : Apple 'Encore.'
Messrs. Veitch, Exeter : Apples.

FRUIT AND VEGETABLE COMMITTEE, APRIL 11, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and two members present.

No exhibits were before the Committee on this occasion. A short discussion took place on the cracking of the bark of fruit trees caused by the weather.

FRUIT AND VEGETABLE COMMITTEE, APRIL 24, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Award Recommended :—

Silver-gilt Banksian Medal.

To the Alliance Vegetable Company, London, for dried vegetables.

Other Exhibit.

Mr. G. W. Miller, Wisbech : Rhubarb ' The Sutton.'

FRUIT AND VEGETABLE COMMITTEE, MAY 8, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for a collection of vegetables.

Silver Banksian Medal.

To Messrs. Dobbie, Edinburgh, for a collection of Potatos.

Other Exhibits.

Mr. J. C. Allgrove, Slough : Apples.
Alliance Vegetable Co., London : dried vegetables.
Mr. F. Davis, Pershore : Apple ' Pershore Pippin.'
Mr. G. W. Miller, Wisbech : Rhubarb ' The Sutton.'
R.H.S. Gardens, Wisley : Potatos.
Mr. R. Staward, Hertford : Cabbage ' Red Braes Early.'
Mr. C. Turner, Slough : Apple ' Newton Wonder.'

FRUIT AND VEGETABLE COMMITTEE, MAY 22, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for Potatos.

Silver Banksian Medal.

To Hon. Mrs. R. Greville (gr. Mr. H. Prince), Dorking, for vegetables and salads.

It was proposed that a trial should be held at Wisley in 1918 of Potatos raised from seed, not tubers.

Fruit and Vegetable Committee, June 5, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and eleven members present.

Award Recommended:—

Gold Medal.

To Messrs. Barr, Covent Garden, for a collection of vegetables.

Fruit and Vegetable Committee, June 19, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and sixteen members present.

Award Recommended:—

Silver-gilt Banksian Medal.

Mr. V. Banks, London, for bottled fruits and vegetables.

Other Exhibits.

F. H. Chapman, Esq., Rye: Marrow 'Rotherside Orange.'
Mr. E. A. Hall, Bristol: Melon 'Brislington Acquisition.'
Mr. J. Roberts, Tunbridge Wells: Apple 'Gooseberry Pippin.'
Mr. R. Staward, Hertford: Cabbages and Lettuce.
Mr. G. G. Whitelegg, Chislehurst: 'The Newberry.'

FLORAL COMMITTEE.

JANUARY 16, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations.

Award of Merit.

To *Corylus Avellana contorta* (votes 10 for, 5 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A very curious and interesting sport from the common nut, having all its shoots irregularly twisted or contorted. It was first found growing in a hedgerow, and it does not vary, but always keeps true to its peculiar habit of growth.

To *Cyclamen persicum* 'Crimson St. George' (votes 13 for), from St. George's Nursery Co., Harlington. A variety with large, well-formed flowers of a rich crimson colour and handsome variegated foliage. The leaves have a border about 1 inch wide of silver grey, and the centre is green, beautifully veined.

Other Exhibits.

Messrs. Bunyard, Maidstone: *Erlangea tomentosa.*

Messrs. Cannell, Eynsford: Pelargoniums.

Mrs. Hopkinson, Shepperton: hardy plants.

FLORAL COMMITTEE, JANUARY 30, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Award Recommended :—

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Other Exhibits.

Messrs. Felton, London: Eucalyptus and Mimosa.

Sir William Lawrence, Bt., Dorking: sport from *Primula malacoides.*

Fruit and Vegetable Committee, June 5, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and eleven members present.

Award Recommended :—

Gold Medal.

To Messrs. Barr, Covent Garden, for a collection of vegetables.

Fruit and Vegetable Committee, June 19, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and sixteen members present.

Award Recommended :—

Silver-gilt Banksian Medal.

Mr. V. Banks, London, for bottled fruits and vegetables.

Other Exhibits.

F. H. Chapman, Esq., Rye : Marrow 'Rotherside Orange.'
Mr. E. A. Hall, Bristol : Melon 'Brislington Acquisition.'
Mr. J. Roberts, Tunbridge Wells : Apple 'Gooseberry Pippin.'
Mr. R. Staward, Hertford : Cabbages and Lettuce.
Mr. G. G. Whitelegg, Chislehurst : 'The Newberry.'

FLORAL COMMITTEE.

JANUARY 16, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations.

Award of Merit.

To *Corylus Avellana contorta* (votes 10 for, 5 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A very curious and interesting sport from the common nut, having all its shoots irregularly twisted or contorted. It was first found growing in a hedgerow, and it does not vary, but always keeps true to its peculiar habit of growth.

To *Cyclamen persicum* 'Crimson St. George' (votes 13 for), from St. George's Nursery Co., Harlington. A variety with large, well-formed flowers of a rich crimson colour and handsome variegated foliage. The leaves have a border about 1 inch wide of silver grey, and the centre is green, beautifully veined.

Other Exhibits.

Messrs. Bunyard, Maidstone: *Erlangea tomentosa.*

Messrs. Cannell, Eynsford: Pelargoniums.

Mrs. Hopkinson, Shepperton: hardy plants.

FLORAL COMMITTEE, JANUARY 30, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Award Recommended :—

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Other Exhibits.

Messrs. Felton, London: Eucalyptus and Mimosa.

Sir William Lawrence, Bt., Dorking: sport from *Primula malacoides.*

Fruit and Vegetable Committee, June 5, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and eleven members present.

Award Recommended:—

Gold Medal.

To Messrs. Barr, Covent Garden, for a collection of vegetables.

Fruit and Vegetable Committee, June 19, 1917.

Mr. J. Cheal, V.M.H., in the Chair, and sixteen members present.

Award Recommended:—

Silver-gilt Banksian Medal.

Mr. V. Banks, London, for bottled fruits and vegetables.

Other Exhibits.

F. H. Chapman, Esq., Rye: Marrow 'Rotherside Orange.'
Mr. E. A. Hall, Bristol: Melon 'Brislington Acquisition.'
Mr. J. Roberts, Tunbridge Wells: Apple 'Gooseberry Pippin.'
Mr. R. Staward, Hertford: Cabbages and Lettuce.
Mr. G. G. Whitelegg, Chislehurst: 'The Newberry.'

FLORAL COMMITTEE.

JANUARY 16, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations.

Award of Merit.

To *Corylus Avellana contorta* (votes 10 for, 5 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A very curious and interesting sport from the common nut, having all its shoots irregularly twisted or contorted. It was first found growing in a hedgerow, and it does not vary, but always keeps true to its peculiar habit of growth.

To *Cyclamen persicum* 'Crimson St. George' (votes 13 for), from St. George's Nursery Co., Harlington. A variety with large, well-formed flowers of a rich crimson colour and handsome variegated foliage. The leaves have a border about 1 inch wide of silver grey, and the centre is green, beautifully veined.

Other Exhibits.

Messrs. Bunyard, Maidstone : *Erlangea tomentosa.*
Messrs. Cannell, Eynsford : Pelargoniums.
Mrs. Hopkinson, Shepperton : hardy plants.

FLORAL COMMITTEE, JANUARY 30, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Award Recommended :—

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Other Exhibits.

Messrs. Felton, London : Eucalyptus and Mimosa.

Sir William Lawrence, Bt., Dorking : sport from *Primula malacoides.*

Floral Committee, February 13, 1917.

Mr. E. A. Bowles, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Mr. J. MacDonald, Harpenden, for grasses.

Silver Flora Medal.

To Mr. J. Simmons, Hounslow, for forced bulbs.

Silver Banksian Medal.

To Messrs. Chapman, Rye, for flowering bulbs.
To Messrs. S. Low, Bush Hill Park, for Carnations.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Award of Merit.

To *Freesia* 'La France' (votes 17 for), from Messrs. H. Chapman, Rye. A beautiful seedling, resulting from a cross between *F. Leichtlinii* and a Dutch-raised hybrid. The flowers are very large, of a mauve-violet colour with a white throat, and are sweetly scented.

To *Primula malacoides alba plena* (votes unanimous), from Messrs. W. & J. Brown, Stamford. A good double white form of this well-known greenhouse Primula.

Other Exhibits.

Messrs. Cheal, Crawley: Polyanthus.
Messrs. Dobbie, Edinburgh: Sweet Peas.

Floral Committee, February 27, 1917.

Mr. H. B. May, V.M.H., in the Chair, and eighteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Silver Banksian Medal.

To Miss J. Gundry, Sidcup Hill, for paintings.
To Messrs. Low, Bush Hill Park, for Cyclamen and Carnations.

Bronze Flora Medal.

To Messrs. Cheal, Crawley, for flowering shrubs and alpines.
To Mr. J. C. Jenner, Rayleigh, for Carnations.
To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Misses Allen-Brown, Henfield, for Violets.

To Messrs. H. Chapman, Rye, for bulbous plants.

Award of Merit.

To Cyclamen 'Cherry Ripe' (votes 15 for, 2 against), from Messrs. Low, Bush Hill Park. The flowers of this variety are borne very freely, of a striking bright reddish carmine colour, and of medium size. The foliage is dark green and slightly marbled.

Other Exhibit.

Mr. C. Elliott, Stevenage: Saxifrages.

FLORAL COMMITTEE, MARCH 13, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for forced shrubs.

To Messrs. Cuthbert, Southgate, for *Lachenalia Nelsonii.*

Silver Banksian Medal.

To Mr. J. C. Jenner, Rayleigh, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Barr, Taplow, for bulbous plants and Japanese trees.

To Messrs. Carter, Raynes Park, for *Primula malacoides* 'King Albert.'

To Messrs. Cheal, Crawley, for hardy plants.

To Mr. G. Reuthe, Keston, for hardy plants.

Other Exhibits.

Messrs. H. Chapman, Rye: bulbous plants.

L. A. de Sausmarez, Esq., East Molesey: seedling Camellias.

Mr. E. J. Hicks, Twyford: Roses.

Misses Hopkins, Shepperton: hardy plants.

Mr. G. W. Miller, Wisbech: hardy plants.

FLORAL COMMITTEE, MARCH 27, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To Mr. J. C. Jenner, Rayleigh, for Carnations.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To R.H.S. Gardens, Wisley, for alpines in pans.

Bronze Flora Medal.

To Messrs. Tucker, Oxford, for alpines.

Bronze Banksian Medal.

To Messrs. Barr, Taplow, for alpines.

To Messrs. Cheal, Crawley, for hardy plants.

To Messrs. Cutbush, Highgate, for hardy plants and forced shrubs.

To Mr. E. J. Hicks, Twyford, for Roses.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Mr. G. Reuthe, Keston, for hardy plants.

Cultural Commendation.

To R.H.S. Gardens, Wisley, for a collection of alpines in pots and pans.

First-class Certificate.

To *Saxifraga Burseriana Gloria* (votes 8 for, 3 against), from the R.H.S. Gardens, Wisley. This very fine form of *S. Burseriana*, with pure white flowers over 1 inch across, received an Award of Merit on March 19, 1907. On the present occasion the pan exhibited was a mass of fine flowers.

Other Exhibits.

Messrs. Cannell, Eynsford: Pelargoniums.

Mr. C. Elliott, Stevenage: alpines.

Misses Hopkins, Shepperton: hardy plants.

FLORAL COMMITTEE, APRIL 11, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and seventeen members present.

Awards Recommended:—

Silver Flora Medal.

To Mr. E. J. Hicks, Twyford, for Roses.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Bronze Flora Medal.

To Mr. C. Elliott, Stevenage, for miniature rock gardens.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. Tucker, Oxford, for alpines.

Other Exhibits.

Messrs. Barr, Taplow: alpines.

Misses Hopkins, Shepperton: hardy plants.

Floral Committee, April 24, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for forced flowering plants.

To Mr. E. J. Hicks, Twyford, for Roses.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. S. Low, Bush Hill Park, for Carnations and Acacias.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Bronze Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Pelargoniums.

To Misses Hopkins, Shepperton, for hardy plants.

To Messrs. Waterer, Sons, & Crisp, Bagshot, for alpines.

Award of Merit.

To *Androsace ciliata* (votes 21 for), from Messrs. Tucker, Oxford. A charming dwarf alpine plant from the Pyrenees, with small deep carmine pink flowers, which are borne abundantly. The height of the plant is from 2 to 3 inches, and the leaves, which are lanceolate oblong with ciliated margins, are in rosettes, forming dense cushions.

Other Exhibits.

A. K. Bulley, Esq., Neston : *Isopyrum grandiflorum.*

Messrs. Cheal, Crawley : hardy plants.

Mr. C. Elliott, Stevenage : alpine plants.

Messrs. Fletcher, Chertsey : seedling Aucuba.

Messrs. Ware, Feltham : *Rhizocodon macrophylla.*

Floral Committee, May 4, 1917.

Sub-Committee at Wisley.

Mr. H. B. May, V.M.H., in the Chair, and five members present.

The Sub-Committee inspected the Trial of Stocks under glass and made recommendations for awards to be approved by the full Committee (see p. xlviii).

FLORAL COMMITTEE, MAY 8, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. E. J. Hicks, Twyford, for Roses.

To R. L. Mond, Esq. (gr. Mr. Hall), Sevenoaks, for Calceolarias.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. S. Low, Bush Hill Park, for Carnations and Acacias.

Silver Banksian Medal.

To Mr. J. C. Allgrove, Slough, for Auriculas.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cutbush, Highgate, for Azaleas, Primulas &c.

To Messrs. Dobbie, Edinburgh, for Schizanthus.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Mr. J. C. Jenner, Rayleigh, for Carnations.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Messrs. Piper, Langley, for *Rosa Hugonis* and Clematis.

Bronze Flora Medal.

To Messrs. Cannell, Eynsford, for Pelargoniums.

To Messrs. F. Cant, Colchester, for Roses.

To Mr. G. Kerswill, Exeter, for Gentians.

To Mr. G. Prince, Longworth, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

To Mr. C. Turner, Slough, for Auriculas.

Award of Merit.

To Primula 'Eureka' (votes unanimous), from Adeline, Duchess of Bedford (gr. Mr. J. Dickson), Chenies. A Primula of remarkable vigour, said to be a hybrid between *P. obconica* and *P. sinensis*, the latter being the pollen parent. The flowers are exceptionally large, and are of a rosy carmine colour with a conspicuous greenish eye. They are borne in large trusses, and the foliage is very large and elongated.

To Primula sinopurpurea (votes 9 for, 1 against), from Messrs. Wallace, Colchester. A charming species, introduced from China by Mr. G. Forrest. The flowers are of a deep violet-purple colour with a greenish-white eye, and are borne in heads of 6 or 7 on mealy stalks about 6 inches high. The smooth spathulate leaves are dark green above, and covered with golden meal underneath. They are from 4 to 5 inches long.

To *Rosa Hugonis* (votes 11 for), from Messrs. Piper, Langley. A very distinct species from Western China. The flowers are single, sulphur-yellow in colour, and very freely produced. The plant seems well adapted for growing as a pillar plant or as a weeping standard.

To Schizanthus 'Dr. Badger's Hybrids' (votes unanimous), from Messrs. Dobbie, Edinburgh. A good strain, giving plants of nice compact habit bearing large flowers of a great variety of colours.

Other Exhibits.

Messrs. Cheal, Crawley: hardy plants.
Mr. C. Elliott, Stevenage: Primulas.
H. J. Elwes, Esq., Cheltenham: miscellaneous plants.
Misses Hopkins, Shepperton: hardy plants.
Miss Mangles, Seale: Rhododendron 'Lisa Stillman.'
Mrs. Martineau, Twyford: Ranunculus 'Creamcup.'
Mr. W. H. Robbins, Lewes: Pelargoniums.
Mr. R. Staward, Hertford: Auriculas and Primulas.
Messrs. Tucker, Oxford: alpine plants.
Messrs. Veitch, Exeter: Myosotis 'Blue Eyes.'
Earl of Warwick, Dunmow: Petunia 'Countess of Warwick.'
Mr. C. F. Waters, Balcombe: Carnation 'Emily Gibbs.'

FLORAL COMMITTEE, MAY 17, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. H. B. MAY, V.M.H., in the Chair, and four members present.

The Sub-Committee inspected the Trials of Stocks and Myosotis, and made recommendations for awards to be approved by the full Committee (see pp. xlviii, xlix).

FLORAL COMMITTEE, MAY 22, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Piper, Langley, for miscellaneous climbers and alpines.

Silver Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Cheal, Crawley, for flowering trees and shrubs.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. Low, Bush Hill Park, for Carnations, Acacias, &c.
To Mr. G. W. Miller, Wisbech, for hardy plants.

Silver Banksian Medal.

To Messrs. Carter, Raynes Park, for Streptocarpus.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

To Mr. C. Turner, Slough, for Lilacs &c.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cutbush, Highgate, for greenhouse plants and alpines.

Bronze Banksian Medal.

To Messrs. Baker, Codsall, for alpines.

To Mr. R. Bolton, Halstead, for Sweet Peas.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Messrs. Tucker, Oxford, for alpines.

To Yokohama Nursery Co., London, for Wistarias, Maples, dwarf trees, &c.

Award of Merit.

To *Exochorda Alberti macrantha* (votes unanimous), from Messrs. G. Paul, Cheshunt. A hybrid raised by Messrs. Lemoine of Nancy. The habit resembles that of *E. grandiflora,* and it is remarkably free-flowering. The flowers are white, about $1\frac{1}{2}$ inch across, and are borne in racemes of six to ten.

Other Exhibits.

Adeline, Duchess of Bedford, Chenies: Primula 'Eureka.'

Messrs. Barr, Taplow: *Heuchera tiarelloides.*

Mr. C. Elliott, Stevenage: alpines.

H. J. Elwes, Esq., Cheltenham: Pæonies.

Misses Hopkins, Shepperton: hardy plants.

Mr. G. Kerswill, Exeter: Gentians.

R.H.S. Gardens, Wisley: Primula (Farrer, No. 21) and *Meconopsis quintuplinervia.*

Messrs. Whitelegg, Chislehurst: Schizanthus 'Chislehurst Hybrids.'

Miss E. Willmott, V.M.H., Great Warley: *Lilium Thomsonianum.*

The following recommendations for awards to Stocks grown under glass and Myosotis on trial at Wisley were confirmed. For descriptions see reports of the trials.

STOCKS.

Award of Merit.

14, Crimson Brompton, sent by Messrs. R. Veitch, Exeter; 166, Mammoth Pale Lilac, sent by Mr. Dawkins, Chelsea; 112, Mammoth Pyramid Flesh Colour, sent by Messrs. Hurst, London; 133, Mammoth Rose, sent by Mr. Dawkins, Chelsea; 162, Nice Giant Light Blue, sent by Messrs. Nutting, London.

Highly Commended.

137, Abundance, sent by Messrs. Dickson & Robinson, Manchester; 101, 102, Almond Blossom, sent by Messrs. R. Veitch, Exeter, and Messrs. Hurst, London; 114, 117, 118, Beauty of Nice, sent by Messrs. Dickson & Robinson, Messrs. Hurst, and Messrs. Watkins & Simpson, London; 177, 178, Côte d'Azur, sent by Messrs. R. Veitch and Messrs. Hurst; 45, East Lothian Crimson, sent by Mr. A. Dawkins; 40, East Lothian Scarlet, sent by Messrs. R. Veitch; 13, Giant Brompton Crimson, sent by Messrs. Barr, London; 78, H. J. Vansittart Neale, sent by Messrs. Hurst; 70, Intermediate White, sent by Messrs. R. Veitch; 152, John Bright, sent by Messrs. Dickson & Robinson; 82, 84, 86, Madame Rivoire, sent by Messrs. Dickson & Robinson, R. Veitch, and Hurst; 173, 174, Mammoth Dark Blue, sent by Mr. Dawkins and Messrs. Hurst; 132, Mammoth Pyramidal Rose, sent by Messrs. Hurst; 124, Mammoth Pyramid Salmon Rose, sent by Messrs. Hurst; 156, Mammoth Pyramid 10-week Blood Red, sent by Messrs. Hurst; 147, Mammoth Pyramid 10-week Crimson, sent by Messrs. Hurst; 167, Mammoth Pyramid 10-week Lilac, sent by Messrs. Hurst; 108, Mammoth Pyramid Yellow, sent by Messrs. Hurst; 88, Mont Blanc, sent by Messrs. Hurst; 107, Nice Canary Yellow, sent by Messrs. Watkins & Simpson; 123, Nice Giant Early Salmon, sent by Messrs. Nutting, London; 122, Novelty (unnamed), sent by Messrs. Hurst; 164, 165, Parma Violet, sent by Messrs. Barr, and Messrs. Hurst; 76, Perpetual White, sent by Mr. A. Dawkins; 104, Princess May, sent by Messrs. R. Veitch; 27, Purple Brompton, sent by Messrs. R. Veitch; 119, Pyramid Chamois, sent by Messrs. Watkins & Simpson; 127, 128, 129, Queen Alexandra, sent by Messrs. Hurst, Messrs. Watkins & Simpson, Messrs. Dickson & Robinson; 139, 140, Rose of Nice, sent by Messrs. R. Veitch and Messrs. Hurst; 113, Souvenir de Nice, sent by Messrs. Barr; 28, Violet Queen, sent by Messrs. Daniels, Norwich; 91, White of Nice, sent by Messrs. Watkins & Simpson; 93, White of Nice, No. 2, sent by Messrs. Hurst; 109, Yellow of Nice, sent by Messrs. Hurst.

Myosotis.

Award of Merit.

82, *alpestris* Indigo Queen, sent by Messrs. R. Veitch, Exeter.

Highly Commended.

83, *alpestris* Indigo Queen, sent by Rev. J. Jacob, Whitchurch; 14, *alpestris alba*, sent by Messrs. Hurst, London; 12, *alpestris stricta alba*, sent by Messrs. Hurst; 63, Blue Eyes, sent by Messrs. R. Veitch, Exeter; 62, Bouquet (blue), sent by Messrs. Sutton, Reading; 15, Perfection Rose, sent by Messrs. Sutton; 23, Pink Gem, sent by Messrs. Sutton; 9, Pyramid White, sent by Messrs. Carter, Raynes Park; 87, Royal Blue, sent by Messrs. Sutton; 11, *stricta* White Gem, sent by Messrs. Barr, London; 16, Victoria Rose, sent by Messrs. Barr; 3, White Pearl, sent by Mr. E. H. Bowers, Roscommon.

Floral Committee, June 5, 1917.

Mr. H. B. May, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended :—

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas, Antirrhinums, and Aquilegias.

Silver-gilt Banksian Medal.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Messrs. Piper, Langley, for Clematis and alpines.

To Messrs. Wallace, Colchester, for Irises.

Silver Flora Medal.

To Mr. J. C. Allgrove, Slough, for Eremurus and Anchusas.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. E. J. Hicks, Twyford, for Roses.

To Messrs. S. Low, Bush Hill Park, for Carnations, Streptocarpus, &c.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

To Mr. G. W. Miller, Wisbech, for hardy plants.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Cheal, Crawley, for flowering trees and shrubs.

To Mr. J. Douglas, Great Bookham, for Border Carnations.

To Messrs. G. Paul, Cheshunt, for trees and shrubs.

To Messrs. Whitelegg, Chislehurst, for alpines.

Bronze Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. Cutbush, Highgate, for greenhouse and hardy plants.

To Mr. R. C. Notcutt, Woodbridge, for flowering shrubs.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Pelargoniums.

To Mr. F. Gifford, Hornchurch, for Pæonies.

Mr. J. C. Jenner, Rayleigh, for Carnations.

First-class Certificate.

To *Robinia Kelseyi* (votes 16 for, 6 against), from Mr. J. C. Allgrove, Slough. This beautiful deciduous shrub or small tree received an Award of Merit in 1910. The leaves are pinnate, and from 4 to 6 inches long. The rose-pink flowers are borne abundantly in small clusters.

Award of Merit.

To Antirrhinum 'Prima Donna' (votes unanimous), from Messrs. Dobbie, Edinburgh. This is a variety of medium height, and had bold massive spikes of Apricot flowers shaded with salmon, and having a yellow-tinged lip.

To Carnation 'Maldwin Drummond' (votes 12 for, 6 against), from Captain Drummond (gr. Mr. L. Smith), Cadland Park, Southampton. A good perpetual-flowering variety, with large pale salmon-pink flowers. The calyces are non-bursting, and the stems are stiff and wiry.

To *Deutzia Vilmorinae* (votes unanimous), from Mr. J. C. Allgrove, Slough, and Mr. C. Turner, Slough. This is one of the most valuable of the Deutzias, and is a native of Szechwan, China. It is very free-flowering in habit, and the individual flowers are white and measure about 1 inch across. The foliage is oblong lanceolate, dark green above, and glaucous beneath.

To Iris 'Ringdove' (votes 10 for, 1 against), from Messrs. Wallace, Colchester. A beautiful Iris of the Pallida type. The flowers are about 4½ inches deep, the standards are pale violet, and the falls a little deeper. The beard is white, tipped with yellow. The foliage is very glaucous.

To *Iris sibirica* 'Perry's Blue' (votes 15 for, 5 against), from Mr. A. Perry, Enfield. This is the tallest and most effective of the *sibirica* group. The standards are pale mauve, and the falls are violet-mauve in colour, and broad and round in shape.

To *Magnolia Watsonii* (votes 18 for, 1 against), from Mr. J. C. Allgrove, Slough. The flowers of this beautiful species are about 5 or 6 inches across, and strongly perfumed. The inner petals are white, and the outer ones are tinged with rose. The stamens are crimson and form a conspicuous mass in the centre of the flower. The dark-green leaves are obovate and about 5 or 6 inches long.

To *Syringa* 'Miss Ellen Willmott' (votes unanimous), from Mr. C. Turner, Slough, and Messrs. G. Paul, Cheshunt. This is one of the best double white Lilacs in cultivation. The individual flowers are of large size and are borne in large trusses.

Other Exhibits.

Messrs. Chapman, Rye: Irises.
Mr. G. R. Downer, Chichester: Lupines.
Mr. C. Elliott, Stevenage: alpines.
Miss Greaves, Reigate: *Lonicera quinquelocularis.*
Misses Hopkins, Shepperton: hardy plants.
E. McIlwaine, Esq., Belfast: Pyrus 'Anemonefield Scarlet.'
Messrs. Smith, Stranraer: Rhododendron 'Helen Smith.'
Miss Willmott, V.M.H., Great Warley: *Campanula rupestris.*

FLORAL COMMITTEE, JUNE 8, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. H. B. MAY, V.M.H., in the Chair, and five members present.

The Sub-Committee inspected the trials of Perennial Poppies and Tall Bearded Irises, and made recommendations for awards for the consideration of the full Committee (see p. liii).

FLORAL COMMITTEE, JUNE 19, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-eight members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Kelway, Langport, for Delphiniums and Pæonies.

Silver Flora Medal.

To Mr. J. C. Allgrove, Slough, for hardy plants.
To Messrs. B. R. Cant, Colchester, for Roses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. W. Paul, Waltham Cross, for Roses and Pæonies.
To Messrs. Piper, Langley, for Clematis and alpines.
To Mr. L. R. Russell, Richmond, for Acers.
To Messrs. Simpson, Birmingham, for Antirrhinums.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Chaplin, Waltham Cross, for Roses.
To Mr. J. Douglas, Great Bookham, for Border Carnations.
To Messrs. May, Upper Edmonton, for miscellaneous plants.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Mr. G. Reuthe, Keston, for alpines, Pæonies, &c.
To Mr. C. Turner, Slough, for flowering shrubs.

Bronze Flora Medal.

To Messrs. S. Low, Bush Hill Park, for Roses and Carnations.

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Roses and herbaceous plants.
To Messrs. F. Cant, Colchester, for Roses.
To Mr. G. Prince, Longworth, for Roses.
To Messrs. Tucker, Oxford, for alpines.

Award of Merit.

To Sweet Pea 'Alex. Malcolm' (votes 15 for), from Messrs. Dobbie, Edinburgh. A beautifully waved, large-flowered variety of a scarlet colour tinged with cerise.

To Sweet Pea 'Elegance' (votes 9 for, 3 against), from Messrs. Alex. Dickson, Belfast. A beautiful soft blush-pink variety of large size.

To Sweet Pea 'Mrs. Tom Jones' (votes unanimous), from Messrs. Dobbie, Edinburgh. A large lavender-coloured variety shaded with mauve.

To *Trollius Ledebouri* (votes unanimous), from Mr. J. C. Allgrove, Slough. A beautiful hardy plant introduced from Western China by Mr. Purdom in 1909. It grows about 3 feet high, and the semi-double flowers which measure slightly over 2½ inches across are deep orange. The plant is very free-flowering.

Other Exhibits.

Messrs. Cheal, Crawley: Pæonies and Dahlias.

Misses Hopkins, Shepperton: hardy plants.

Mr. H. Howard, Purfleet: seedling Liliums.

C. J. Lucas, Esq., Horsham: *Juniperus procera.*

Messrs. G. Paul, Cheshunt: Roses.

Messrs. R. Veitch, Exeter: *Aster yunnanensis atroviridis.*

The following awards, recommended by the Sub-Committee to Oriental Poppies and Tall Bearded Irises on trial at Wisley, were confirmed.

ORIENTAL POPPIES.

Highly Commended.

66, 'Beauty of Livermere,' sent by Messrs. Wallace; 17, 'Bobs,' sent and raised by Mr. Notcutt, Woodbridge; 67, 'Boadicea,' sent and raised by Messrs. Barr, Taplow; 35, 'Cerise Beauty,' sent and raised by Messrs. Barr; 3, 'Elsie G. Harkness,' sent and raised by Messrs. Harkness; 20, 'Felix,' sent and raised by Mr. Notcutt; 59, 'Hesperia,' sent by Messrs. Bunyard; 32, 'Mrs. J. Harkness,' sent by Messrs. Harkness; 26, 'Mrs. Perry,' sent by Messrs. Barr, raised by Mr. Perry; 48, 'Orange Globe,' sent and raised by Messrs. R. Veitch; 30, 'Rose Queen,' sent by Messrs. Wallace; 52, 'Royal Scarlet,' sent and raised by Messrs. Barr; 56, 'Taplow Scarlet,' sent and raised by Messrs. Barr; 33, 'V. L. Harkness,' sent and raised by Messrs. Harkness.

Commended.

44, 'Silverblick,' sent by Mr. Notcutt.

TALL BEARDED IRISES.

Award of Merit.

841, 'Dominion,' sent and raised by Mr. A. J. Bliss, of Tavistock; 58, 138, 139, 144, 635, '*pallida dalmatica*,' from Messrs. Forbes, R. Veitch, and Wisley; 276, 778, *pallida* 'Princess Beatrice,' from Messrs. Barr and Bunyard; 686, *pallida* 'Rev. W. Wilks,' sent by Messrs. Bunyard; 686 is identical with 276 and 778, and with *pallida dalmatica.*

Highly Commended.

582, 'Le Rêve,' sent by Mr. Perry, Enfield; 'Mary,' from Mr. G. Reuthe, Keston.

Commended.

423, 536, 'Calypso,' sent by Messrs. Barr and Mr. Perry; 810, 'Dawn,' sent by Messrs. Wallace, Colchester; 527, 628, 'Innocenza,' sent by Mr. Perry and Messrs. Forbes; 837, 'Rosalind,' sent by Mr. Bliss, of Tavistock.

For descriptions of the above see reports of Wisley Trials.

ORCHID COMMITTEE.

JANUARY 16, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for a group.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums, Odontiodas, &c.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for hybrid Cymbidiums.

To Messrs. Hassall, Southgate, for Cymbidiums.

First-class Certificate.

To *Odontoglossum* × 'Felicia' (*Thompsonianum* × *crispum*) (votes unanimous), from Messrs. Charlesworth. Flowers nearly as large as those of *O. crispum*, pale rose, heavily blotched with claret colour.

Award of Merit.

To *Cypripedium* × *Lathamianum* var. 'Cardinal Mercier' (*Spicerianum magnificum* × *villosum*) (votes 9 for, 2 against), from the Rev. J. Crombleholme, St. Mary's, Clayton-le-Moors. A fine flower, with white dorsal sepal, heavily flaked with rose-purple. Petals and lip yellow, tinged with mahogany red.

To *Odontoglossum* × 'Conqueror' (*illustrissimum* × *crispum*) (votes unanimous), from Messrs. Armstrong & Brown. Flowers large, white, evenly blotched with rose-purple.

Preliminary Commendation.

To *Odontoglossum* × 'Peter' (parentage unrecorded), from Messrs. Flory & Black. Flower white, with dark chocolate marking.

Cultural Commendation.

To Mr. W. H. White, orchid-grower to Pantia Ralli, Esq., for *Odontioda* × *keighleyensis*, with six branched spikes of scarlet flowers.

Other Exhibits.

Dr. Lacroze, Roehampton: *Odontioda* × *Gratrixiae*, Bryndir variety (**A.M.** May 2, 1916).

Messrs. Flory & Black: hybrid Odontoglossums and Cypripediums.

Messrs. Sander: a group including very interesting species.

Messrs. Stuart Low: *Brassocattleya* × 'Penelope.'

Baron Bruno Schröder: flowers of *Cypripedium* × 'Eurybiades,' 'The Baroness,' and *C.* × 'Eurybiades,' the Dell variety.

Orchid Committee, January 30, 1917.

Sir Jeremiah Colman, Bt., in the Chair, and eleven members present.

No awards were made on this occasion.

Exhibits.

Messrs. Armstrong & Brown, Tunbridge Wells: seedling Odontoglossums and Odontiodas.

Messrs. Charlesworth, Haywards Heath: Odontoglossums and Cattleyas.

Messrs. Sander, St. Albans: hybrids.

Messrs. Hassall, Southgate: Cymbidiums.

Baron Bruno Schröder: *Cypripedium* × 'Eurybiades' *Shillianum*.

Orchid Committee, February 13, 1917.

Sir Jeremiah Colman, Bt., in the Chair, and fifteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrid Odontoglossums and Odontiodas.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums and Laeliocattleyas.

Award of Merit.

To *Laeliocattleya* × 'Trident' (*L.* × 'Diana' × *C. Trianae Backhouseana*) (votes 11 for, 0 against), from Messrs. Flory & Black, Slough. A showy hybrid, in which the mauve-purple band up the petals of *C. Trianae* is extended in a remarkable degree. Sepals cream white, tinged with rose; petals white, with the inner three-fourths flaked with mauve-purple; lip ruby-red, with yellow base.

Preliminary Commendation.

To *Odontoglossum* × 'Alcibiades' (*eximium* × hybrid unrecorded). Flowers large, white, with the inner halves of the segments densely blotched with claret colour. From Messrs. Armstrong & Brown.

Cultural Commendation.

To Messrs. Armstrong & Brown for a fine specimen of the dwarf *Epidendrum polybulbon* and another of its variety, *album*, the latter having pale-yellow flowers with white lip. Each bore over 100 flowers.

Other Exhibits.

Dr. Miguel Lacroze: *Laeliocattleya* × 'Santa-Fé' (*L.-c.* × 'Copia,' × *C.* × 'Enid').

C. B. Haywood, Esq.: *Cypripedium* × 'Mary' (parentage unrecorded).

J. Ansaldo, Esq., Mumbles: hybrid *Cypripedium*.

Messrs. Sander: *Laeliocattleya* × 'Sir Douglas Haig' (*C.* × 'Octave Doin' × *L.-c.* × 'Henry Greenwood').

Messrs. Flory & Black: *Sophrolaeliocattleya* × 'Myra' (*L.-c.* × 'Myra' × *S.-l.-c.* × 'Althea').

ORCHID COMMITTEE, FEBRUARY 27, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and ten members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

First-class Certificate.

To *Eulophiella* × *Rolfei* (*Elisabethae* × *Peetersiana*) (votes unanimous), from Messrs. Charlesworth. A remarkable hybrid, having the white *E. Elisabethae* as the seed-bearer, but with the habit and colour of *E. Peetersiana*. Inflorescence 3 feet, stout, dark in colour, as in *E. Elisabethae*. Flowers 3 inches across, of thick substance, all the segments broad. Sepals and petals deep rosy-mauve. Lip white, with mauve apex. From the fertilization of the flower to the germination of the seeds only three months elapsed.

Award of Merit.

To *Miltonia* × 'Venus' (*vexillaria* × *Phalaenopsis*) (votes unanimous), from Messrs. Charlesworth. *M. vexillaria* was the seed-bearer, and in the habit of the plant and arrangement of the parts of the flower it predominates. The lip, however, much resembles that of *M. Phalaenopsis*. Sepals and petals tinged with rose. Lip white, yellow at the base, the middle bearing ruby-red and purple markings.

To *Cymbidium insigne album* (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. The first albino of the well-known type which bears vinous purple markings on the sepals, petals, and lip. In the variety shown no colour was visible.

To *Odontioda* × 'Joan,' Broadlands variety (*Oda.* × *Charlesworthii* × *Odm.* × *ardentissimum*) (votes unanimous), from E. R. Ashton, Esq., Broadlands, Camden Park, Tunbridge Wells. Flowers deep chocolate-red, with ruby-red spotting on the lip.

Preliminary Commendation.

To *Odontioda* × 'Madeline' var. 'Opal' (*Oda.* × *Charlesworthii* × *Odm. crispum*), from Messrs. Armstrong & Brown. The flower was ruby-claret, with a slight gold tint and of good form.

Other Exhibits.

Messrs. Flory & Black: *Brassolaeliocattleya* × *Harrisonii* (*L.-c.* × 'Juno' × *B.-c.* × 'Mrs. J. Leemann').

Messrs. Stuart Low: three hybrids.

ORCHID COMMITTEE, MARCH 13, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended:—

Silver Flora Medal.

To Sir Jeremiah Colman, Bt., Gatton Park, Surrey (gr. Mr. Collier), for Dendrobiums.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums, Odontiodas, and Laeliocattleyas.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Odontoglossums and Odontiodas.

First-class Certificate.

To *Laeliocattleya* × 'General Maude' (*L.-c.* × 'Rubens' *Lambeauiae* × *C. Hardyana*) (votes unanimous), from Messrs. Charlesworth. A noble flower borne on a plant of dwarf habit. Sepals and petals broad, rosy-mauve, with darker veining. Lip broad, ruby-purple, with a yellowish base.

Award of Merit.

To *Laeliocattleya* × 'Serbia' var. 'The President' (*L.-c.* × 'St. Gothard' × *C.* × 'Enid') (votes unanimous), from Messrs. Charlesworth. In the fine flower of the plant shown, *C. Warneri*, obtained through *L.-c.* × *Gottoiana*, one of the parents of *L.-c.* × 'St. Gothard,' was the prevailing feature. Sepals and petals bright rose. Lip ruby-crimson, with yellow disc and lines from the base.

Preliminary Commendation.

To *Odontoglossum* × *exultans* var. 'Vulcan' (*excellens* × *Ossulstonii*), from Messrs. Armstrong & Brown. Flower dark chocolate-red, with pale-yellow margins and tips to the segments. Lip white, with yellow crest and chestnut-red blotch.

Other Exhibits.

Sir Jeremiah Colman, Bt.: fine hybrid Dendrobiums raised at Gatton Park.

Pantia Ralli, Esq.: *Cattleya* × 'Apelles' (× *Whitei* × *Mendelii* 'King George V.').

Messrs. Sander: hybrids and rare species.

Messrs. Flory & Black, Slough: Odontoglossums and the white *Cattleya* × 'Suzanne Hye de Crom.'

ORCHID COMMITTEE, MARCH 27, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eighteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Silver Banksian Medal.

To Messrs. Cypher, Cheltenham, for spring-flowering Dendrobiums.

To Messrs. McBean, Cooksbridge, for hybrid Cymbidiums.

First-class Certificate.

To *Cypripedium* × 'Eurybiades' 'The Baron' ('Hera Euryades' × 'Alcibiades') (votes unanimous), from Mr. J. E. Shill, The Dell Gardens, Englefield Green. A very large flower with white dorsal sepal, having a green base and profusion of spotted purple lines. Lip and petals yellow, tinged with mahogany-red.

Award of Merit.

To *Brassocattleya* × 'Lady Jellicoe' (*B.-c.* × *Digbyano-Schroederae* × *C. Gaskelliana albens*) (votes unanimous), from Messrs. Armstrong & Brown, Tunbridge Wells. A perfect white flower, with slight rose tint on the sepals, and yellow disc to the fringed lip.

To *Sophrolaeliocattleya* × 'Meuse' var. 'General Nivelle' (*S.-l.-c.* × 'Marathon' × *L.-c.* × *callistoglossa*) (votes unanimous), from Messrs. Charlesworth. Sepals and petals reddish-rose, with a gold tint. Lip crimson, with yellow lines from the base. The best of the three varieties shown; all different.

To *Cattleya* × 'Enid' var. 'Silver Queen' (*Mossiae Reineckiana* × *Warscewiczii* var. 'F. M. Beyrodt') (votes 10 for, 5 against), from Messrs. Charlesworth. A large, pure white flower, with some purple lines in front of the yellow disc of the lip.

To *Odontioda* × 'St. Quentin' (*Oda.* × 'Zephyr' × *Odm.* × *Wiganianum*) (votes unanimous), from Messrs. Flory & Black, Slough. Flowers pale yellow, spotted on the inner parts of the segments with dark red. Front of the lip blush-white, with a dark red band in the centre.

Other Exhibits.

Mrs. Bischoffsheim: *Brassolaeliocattleya* × 'Queen of the Belgians,' Warren House variety.

C. J. Lucas, Esq.: two new hybrid Odontoglossums.

W. Evans, Esq.: *Dendrobium nobile* varieties.

Messrs. Sander: a group.

Messrs. Flory & Black: hybrids.

Messrs. Armstrong & Brown: new Odontoglossums and Odontiodas.

ORCHID COMMITTEE, APRIL 11, 1917.

FREDERICK J. HANBURY, Esq., in the Chair, and eight members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for a group of hybrid Odontiodas and Odontoglossums.

First-class Certificate.

To *Odontioda* × 'Coronation,' Orchidhurst variety (parentage unrecorded) (votes 5 for, 1 against), from Messrs. Armstrong & Brown. Darker in colour and slightly larger in size than the original, for which Mons. Chas. Vuylsteke received a **F.C.C.** May 23, 1911. The flowers of the Orchidhurst variety are over three and a half inches across; the ground colour blush-white, the inner parts of the segments blotched with dark red, and the margins tinged with purple. The parentage is probably *Odontioda* × *Vuylstekeae* crossed with a hybrid Odontoglossum. The fine plant shown bore a four-branched inflorescence of forty-nine flowers.

Other Exhibits.

Mr. J. E. Shill, The Dell Gardens, Englefield Green: *Cattleya* × 'Lady Rowena' (*Warneri alba* × 'Suzanne Hye de Crom').

Messrs. Charlesworth, Haywards Heath: Laeliocattleyas &c.

Messrs. Sander, St. Albans: white Cattleyas and hybrids.

Messrs. Stuart Low, Jarvisbrook: Laeliocattleyas and cut spikes of Vandas.

ORCHID COMMITTEE, APRIL 24, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Odontoglossums and Odontiodas.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for Laeliocattleyas &c.

Preliminary Commendation.

To *Odontoglossum crispum* var. 'Dreadnought' (votes unanimous), from Messrs. Armstrong & Brown. Obtained by crossing two blotched forms of *O. crispum*, and resulting, as is often the case, in the blotching being merged into an almost self-coloured flower. Sepals and petals bright reddish-claret in various shades, margin white.

To *Odontoglossum* × 'Rex' (*crispum* × hybrid unrecorded) (votes unanimous), from Messrs. Armstrong & Brown. Flower large and of fine shape, white, blotched in the inner parts with purple.

Other Exhibits.

Messrs. Sander, St. Albans: species and hybrids.

Messrs. Armstrong & Brown: *Miltonia* × *Hyeana sandhurstiensis* and other hybrid Miltonias.

ORCHID COMMITTEE, MAY 8, 1917.

Sir HARRY J. VEITCH in the Chair, and fifteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs Armstrong & Brown, Tunbridge Wells, for hybrid Odontoglossums &c.

To Messrs. Charlesworth, Haywards Heath, for Odontoglossums and Laeliocattleyas.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrids and rare species.

To Mr. C. F. Waters, Balcombe, for Dendrobiums.

Award of Merit.

To *Dendrobium* × *illustre* var. 'Florence Bartels' (*Dalhousieanum* × *chrysotoxum*) (votes unanimous), from Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier). Habit of *D. Dalhousieanum.* Flowers cowslip yellow, with a veined blotch of claret colour on each side of the lip. The original, shown by Messrs. Jas. Veitch, obtained a **F.C.C.** June 25, 1895.

To *Selenipedium caudatum Sanderae* (votes 6 for, 3 against), from Messrs. Sander, St. Albans. Near to *S. caudatum Wallisii*, and said to be identical with the type *Cypripedium* (*Selenipedium*) *caudatum*, not now in gardens. Flowers green, with white showing between the veining of the long sepals and petals.

To *Odontioda* × 'Cardinal' (parentage unrecorded) (votes unanimous), from Baron Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flowers rose-tinted, with deep red blotches on the segments. Front of lip white.

Preliminary Commendation.

To *Odontoglossum crispum* var. 'President Wilson' (votes unanimous), from Messrs. Armstrong & Brown. A large white flower, heavily blotched with claret-red.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Dendrobium* × *illustre Bartelsianum* and *Odontoglossum* × *Thompsonianum pallidum.*

Leonard Dixon, Esq., St. Albans: *Odontioda* × *Charlesworthii* var.

Messrs. Stuart Low: hybrids.

ORCHID COMMITTEE, MAY 22, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Miltonias, Odontoglossums, &c.

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for new Odontoglossums.

To Messrs. Cypher, Cheltenham, for a group of sixty species and hybrids.

To Messrs. McBean, Cooksbridge, for Laeliocattleyas and other hybrids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for many interesting species.

To Messrs. Stuart Low, Jarvisbrook, for a group including *Renanthera Imschootiana.*

Award of Merit.

To *Odontioda* × 'General Haig' (*Odm.* × 'Aglaon' × *Oda.* × *Vuylstekeae*) (votes 16 for, 0 against), from Messrs. Armstrong & Brown. Flowers large cream white, blotched with Indian red, margins light violet. The spike bore sixteen flowers.

Preliminary Commendation.

To *Odontoglossum* × 'Fabia' *splendens* (× 'Aglaon' × *eximium*) (votes 14 for, 1 against), from Messrs. Armstrong & Brown. Flower large, dark claret-purple, with white margin.

Other Exhibits.

Sir Jeremiah Colman, Bt.: scarlet Odontiodas.
Baron Bruno Schröder: Laeliocattleyas.
G. W. Bird, Esq.: *Odontioda* × 'Gladys' var. 'Famille Rose.'
Messrs. Flory & Black: *Odontioda* × 'St. Quentin.'

ORCHID COMMITTEE, JUNE 5, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for new hybrids.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for *Cattleya Mossiae* and hybrids.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for Laeliocattleyas.

Award of Merit.

To *Miltonia vexillaria* var. 'Sir Mervyn Buller' (var. 'Memoria G. D. Owen' × var. *Leopoldii*) (votes 11 for, 0 against), from Messrs. Armstrong & Brown. Flower bright rose. Labellum 4 inches across, with an ornate triangular mask of deep maroon at the base.

To *Cypripedium niveum*, The Grange variety (votes unanimous), from Philip Smith, Esq., Manor House, Ashton-on-Mersey (gr. Mr. Thompson). Flowers larger than the type, pure white, with minute purple spotting on the bases of the petals and lip.

Cultural Commendation.

To Mr. Collier, gr. to Sir Jeremiah Colman, Bt., for a fine specimen of *Dendrobium acuminatum*, with six spikes of rose-pink flowers with darker centres.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Saccolabium ampullaceum.*

Dr. Miguel Lacroze: Laeliocattleyas

R. Brooman White, Esq.: Odontoglossums.

ORCHID COMMITTEE, JUNE 19, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended:—

Williams Gold Medal.

To Messrs. Charlesworth, Haywards Heath, for a fine group of home-raised Miltonias.

Silver-gilt Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid Miltonias and Odontoglossums.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for Cattleyas, Laeliocattleyas, &c.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for Laeliocattleyas &c.

Award of Merit.

To *Miltonia* × 'Princess Mary' (*Hyeana* × *Bleuana*) (votes unanimous), from Messrs. Armstrong & Brown. A large white flower, with a tinge of lilac on the petals and a broad purplish-rose mask at the base of the lip.

To *Odontioda* × 'The Prince' (*Oda.* × *Charlesworthii* × *Odm.* × *Adriano-triumphans*) (votes unanimous), from G. W. Bird, Esq., The Manor House, West Wickham (gr. Mr. Redden). Flowers resembling *Odontoglossum crispum*; pale lilac-purple.

Preliminary Commendation.

To *Miltonia* × 'Fairy Queen' ('Princess Mary' × *vexillaria* 'Memoria G. D. Owen') (votes unanimous). The seedling plant bore one large pure white flower, with triangular, ruby-crimson mask on the lip. From Messrs. Armstrong & Brown.

To *Odontoglossum* × 'Felicity' ('Olympia' × *ardentissimum*) (votes unanimous), from Messrs. Charlesworth. A large white flower of fine shape, with clusters of red-brown blotches in the middles of the segments.

Other Exhibits.

G. W. Bird, Esq.: *Odontioda* × 'Aurora.'

Walter Cobb, Esq.: *Laeliocattleya* × 'Ceres.'

C. J. Lucas, Esq.: Odontoglossum hybrids.

NARCISSUS AND TULIP COMMITTEE.

FEBRUARY 17, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and seven members present.

The only exhibit before the Committee was a batch of *Tulipa Kaufmanniana ryensis*, from Messrs. Herbert Chapman, Ltd., Rye. All the plants staged were the descendants of one bulb, and the Committee considered they represented the original species as certificated in 1897.

The Rev. Joseph Jacob gave notice of motion, "That on March 13, 1917, the Committee appoint Schedule, Publications, and Classification Sub-Committees."

NARCISSUS AND TULIP COMMITTEE, FEBRUARY 27, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and seven members present.

At the suggestion of Mr. F. H. Chapman it was agreed that a letter be sent from the Committee to Col. Hugh V. Warrender, congratulating him upon the receipt of the Distinguished Service Order.

Award Recommended :—

Silver Banksian Medal.

To Messrs. R. H. Bath, Wisbech, for a group of Daffodils.

NARCISSUS AND TULIP COMMITTEE, MARCH 13, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and twelve members present.

In accordance with notice of motion the Committee proceeded to elect Sub-Committees, as follows :—

Schedule Sub-Committee.—Rev. G. H. Engleheart, Rev. J. Jacob, Messrs. Walter T. Ware, Peter R. Barr, P. D. Williams, W. B. Cranfield, G. W. Leak, Herbert Smith, J. D. Pearson, and Geo. Monro, junr., and the Chairman and Hon. Sec.

Publications Sub-Committee.—Rev. G. H. Engleheart, Rev. Canon Fowler, Rev. J. Jacob, Miss Willmott, Messrs. J. T. Bennett Pöe, J. D. Pearson, Peter R. Barr, and G. W. Leak, and the Chairman and Hon. Sec.

Classification Sub-Committee.—Rev. W. Wilks, Rev. Joseph Jacob, Rev. G. H. Engleheart, Messrs. J. T. Bennett Pöe, Peter R. Barr, A. M. Wilson, Walter T. Ware, E. M. Crosfield, J. D. Pearson, and G. W. Leak, and the Chairman and Hon. Sec.

A list of Judges for the Daffodil Show was drawn up for the consideration of the Council.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Bath, for a large display of Tulips and Daffodils grown in fibre.

Bronze Banksian Medal.

To Mr. G. W. Miller, Wisbech, for a group of Daffodils.

NARCISSUS AND TULIP COMMITTEE, MARCH 27, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and twelve members present.

It was agreed that the voting for the award of the Peter Barr Memorial Cup should take place on April 17, and that members be notified accordingly.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Bath, for a group of Tulips grown in fibre.

Silver-gilt Banksian Medal.

To Messrs. Bath, for a group of cut Daffodils.

To Messrs. J. R. Pearson, Lowdham, for a group of Daffodils which included many white Trumpet and Giant *Leedsii* varieties.

Award of Merit.

To Narcissus 'Bonaparte' for pot cultivation (votes 9 for, 0 against); an *Incomparabilis* variety, with flattish sulphur-yellow perianth, and a broad, frilled trumpet of deeper hue. From Messrs. Barr, Covent Garden.

NARCISSUS AND TULIP COMMITTEE, APRIL 11, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and eight members present.

Owing to the extreme lateness of the season, and various difficulties incidental to war time, the question of holding the London Daffodil Show was discussed. Members of Committee and other Fellows had written, some urging the postponement of the Show and others suggesting its abandonment. On the motion of the Rev. G. H. Engleheart and Mr. Peter R. Barr, the following resolution was adopted unanimously :—"That the Narcissus and Tulip Committee request the Secretary, Rev. W. Wilks, to advise the Council to abandon the Daffodil Show fixed for April 17." To this the Council agreed.

* Concerning Mr. J. K. Ramsbottom's lecture on "Investigations in the Daffodil Disease," arranged to be given during the afternoon of the Daffodil Show, the Hon. Sec. was requested to endeavour to arrange for the lecture to be delivered at the Horticultural Club, as it was of great importance that the latest information should be made public as early as possible.

* See p. 51.

Awards Recommended :—

Gold Medal.

To Messrs. Bath, for a very extensive and unusually fine group of Darwin Tulips grown in fibre.

Silver-gilt Banksian Medal.

To Messrs. Barr, for a group of Daffodils grown in the open at Gulval, Penzance.

NARCISSUS AND TULIP COMMITTEE, APRIL 24, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and ten members present.

According to the second notice given, the voting for the Award of the Peter Barr Memorial Cup took place at this meeting. The award was made unanimously in favour of Mr. Walter T. Ware, of Inglescombe, Bath, who will hold the Cup for one year.

Awards Recommended :—

Gold Medal.

To Messrs. Barr, for a large group of cut Daffodils containing new seedlings and modern varieties as well as older standard varieties.

Silver gilt-Banksian Medal.

To Messrs. Dobbie, Edinburgh, for a display of Tulips.

Award of Merit.

To Narcissus 'Michael' (votes 8 for, 1 against), a handsome Trumpet variety of large size, fine form, and solid, golden yellow colouring. Raised by Mr. J. C. Williams; shown by Messrs. Barr.

NARCISSUS AND TULIP COMMITTEE, MAY 8, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and seventeen members present.

The Hon. Sec. reported the receipt of a letter from Mr. Walter T. Ware, thanking the Committee for voting him the Peter Barr Memorial Cup for the ensuing year.

Members reported the death of Miss F. Currey, a former member of the Committee; of Mr. Worsley, of Clifton; and of Baron de Soutellinho, of Oporto. The Hon. Sec. was requested to write letters of condolence to the bereaved families.

The Chairman read a letter received from Major Hugh Warrender, thanking the Committee for their letter congratulating him upon the receipt of the Distinguished Service Order.

There was a splendid display of Daffodils on this occasion, eight groups being staged and fifteen novelties submitted for award.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Bath, for cut Daffodils.

Silver-gilt Banksian Medal.

To Mr. J. K. Ramsbottom, R.H.S. Gardens, Wisley, for an exhibit illustrating his investigations in the Daffodil disease.

To Messrs. Pearson, Notts, for cut Daffodils.

To Messrs. Barr, for cut Daffodils.

Silver Banksian Medal.

To Mr. George Churcher, Alverstoke, for Daffodils.

Award of Merit.

To Narcissus 'Queen of Dawn' (votes 8 for, 0 against), a finely formed *Barrii* variety (3*b*) with broad, creamy, pink-tinged perianth segments and a frilled orange-red cup. From Messrs. Barr.

To Narcissus 'Vintage' (votes 14 for, 0 against), a charming hybrid derived from 'King Alfred,' crossed with *Narcissus calathinus*; the large, slightly frilled trumpet and the flat perianth are wholly citron-yellow. The flowers large, drooping, and very graceful. From Messrs. Herbert Chapman.

To Narcissus 'Helmet,' for show purposes (votes 11 for, 2 against), a very giant among Giant *Leedsii* varieties. Flowers five inches across, cream white, with a green base to the frilled trumpet. From Mr. W. J. Cranfield, Enfield Chase.

To *Narcissus poeticus ornatus plenus* (votes 12 for, 0 against), pure white, sweetly scented and double form of the popular *Narcissus poeticus ornatus*. Should prove very useful for market purposes. From Messrs. J. Culpin, Spalding.

NARCISSUS AND TULIP COMMITTEE, MAY 22, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and eleven members present, with Mr. C. W. Needham as visitor.

Awards Recommended:—

Gold Medal.

To Messrs. Dobbie, for a group of late Tulips.

Silver-gilt Flora Medal.

To Messrs. Barr, for a group of late Tulips.

To Mr. A. D. Hall, Merton, for Old English Tulips.

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for Tulips.

To Messrs. R. Wallace, Colchester, for late Tulips.

To Messrs. Bath, for Tulips.

Silver Flora Medal.

To Mr. W. Peters, Farcet House, Cambridge, for Old English Tulips.

NARCISSUS AND TULIP COMMITTEE, JULY 3, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair, and seven members present.

The Committee met at the Horticultural Club, Hotel Windsor, at 10.30 A.M., to consider the Daffodil Show, Daffodil Year Book, &c., for the ensuing year.

It was agreed "That the Council be asked to reserve space especially for Daffodils at the meeting to be held on April 23, 1918, but that no schedule be issued and no prizes offered." It was also agreed "That while continuing to collect material for a Year Book, the Committee does not consider it desirable to publish a Daffodil Year Book in 1917." The Council subsequently agreed to these recommendations.

Mr. Peter R. Barr, Treasurer of the London Daffodil Show Prize Fund, reported a balance in hand of £165 14s., all of which he had placed on deposit at the bank.

The Hon. Sec. reported that through the kindness of the British Wholesale Florists' Federation he would be able to send a reprint of Mr. J. K. Ramsbottom's lecture to each Member of Committee.

ESTABLISHED 1804.

INCORPORATED 1809.

TELEGRAMS: "HORTENSIA SOWEST LONDON."

TELEPHONE: VICTORIA 5363.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W. 1.

NOTICES TO FELLOWS.

1. Important Notices.
2. Chelsea and Holland House.
3. Subscriptions.
4. Form of Bequest.
5. New Fellows.
6. An Appeal.
7. The Society's Gardens at Wisley.
8. Students at Wisley.
9. Distribution of Surplus Plants.
10. Dutch Brown Bean.
11. National Diploma in Horticulture.
12. Examinations, 1918.
13. Information.
14. Inspection of Fellows' Gardens.
15. Affiliation of Local Societies.
16. R.H.S. Gardeners' Diary.
17. Rules for Judging—1914 Code.
18. Food Production Publications.
19. R.H.S. Pamphlets.
20. List of the Most Desirable Fruits.
21. Fruit Bottling for Cottagers.
22. Book on Fruit Bottling.
23. R.H.S. War Relief Fund.
24. Shirley Poppy Seed.

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1. IMPORTANT NOTICES.

1. The Society's Hall in Vincent Square being still occupied by the Australian Imperial Force, the Fortnightly Meetings will continue to be held in the London Scottish Drill Hall, Buckingham Gate, Victoria Street. It is hoped that Fellows will do their utmost to support these Meetings during their temporary transference to the Drill Hall.

2. The Lectures will be given at the Drill Hall.

3. The Society's Offices and Library will continue in Vincent Square as heretofore. The Scientific Committee will also meet as before at Vincent Square.

2. CHELSEA AND HOLLAND HOUSE SHOWS.

The Council greatly regret that War conditions do not permit of the resumption of the Chelsea and Holland House Meetings in 1918. It will be remembered that they had to be abandoned last year on patriotic grounds which are even more imperative this year. Floral, Fruit, and Vegetable Meetings will, however, be held at the Drill Hall on the same dates.

3. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays one full year's subscription, and no further subscription until the following January twelvemonth. To avoid the inconvenience of remembering their subscriptions, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W. 1."

4. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £ to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

5. NEW FELLOWS.

The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as, owing to the great increase in work which has fallen upon, or been voluntarily undertaken by, the Society, it is now more important than ever to fill the places of those who are taken from us. A letter on this subject was sent to all the Fellows in December last. Should any Fellow have failed to receive it, another copy will be sent on application to the Secretary, R.H.S., Vincent Square, London, S.W. 1.

6. AN APPEAL.

What has been accomplished for the Society is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests especially by:—

1. Increasing the Number of Fellows.
2. Presenting Books for the Library at Vincent Square and at Wisley.
3. Sending new or rare Plants, Seeds, and Roots for the Garden and for distribution to Fellows, and for helping to keep the Hospital Camps in France and Flanders, &c., furnished.

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* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to complete this sum?

7. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the 1914 Annual Meeting for the further development of the practical and scientific work at Wisley, the Council were fortunate in securing the services of Dr. Keeble, F.R.S., as Director. By friendly arrangement between the Society and the Imperial College of Science, the Wisley Gardens are now the joint Experimental Entomological Station of the Society and the Imperial College. All communications to the Gardens should be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till 6 P.M., except on Sundays, Good Friday, Christmas Day, and Meeting Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about 3½ miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all on the South-Western Railway. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8s.; or waiting three hours, 10s.; or to and from Horsley or Byfleet, 7s. Motor cars can be had at Byfleet Station by applying to Mr. Finch, The Garage, Byfleet, Surrey. Accommodation and refreshments can be had at the Hut Hotel close to the Gardens, and also at the Hautboy, Ockham.

8. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

9. DISTRIBUTION OF SURPLUS PLANTS.

Some years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive those surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows who had paid the current year's subscriptions the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to return their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden

cannot be disorganized by the sending out of plants at any later time in the year. All Fellows who have paid the current year's subscription can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. Owing to the railways declining to deliver these parcels any longer, they *must* now be sent by post, the postage being prepaid by Fellows. Directions as to the amount of the remittance to be sent will be found on the application form for plants, which kindly consult before sending it in.

Parcels will be addressed exactly as given by each Fellow on the address label accompanying his application form.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

10. THE R.H.S. DUTCH BROWN BEAN.

This Dutch Brown Bean of the Haricot type, introduced to Great Britain by the Society and distributed in the Spring of 1917 has succeeded beyond all expectations, both in its cropping qualities and its popularity as a table vegetable for the winter months. The harvest secured at Wisley will be distributed to Fellows in 1918 through the usual channel of the Plant and Seed distribution. Fellows are urged to distribute their 1917 crop to their friends for sowing in the coming Spring, or to send it to the R.H.S. Gardens, Wisley, Ripley, Surrey, for distribution to other Fellows.

11. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners have welcomed the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National," for, by the consent of H.M. Government, the Department of Agriculture consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations which are held in June are practical, *viva voce*, and written; the practical part being held in a suitable garden.

Information may be obtained by sending a directed envelope, stamped, to the Secretary, Royal Horticultural Society, Vincent Square, S.W. 1.

12. EXAMINATIONS, 1918.

A syllabus of the different examinations can be obtained from the Society's Office, Vincent Square, S.W. 1, post free for 2½*d*.

13. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. 1.* Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

14. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz.: a fee of £3 3*s*. for one day (or £5 5*s*. for two consecutive days),

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* *See* R.H.S. Gardeners' Diary, 1918, page 68—"How to send Specimens for Identification."

together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their Gardens. Gardens can only be inspected at the *written* request of the owner.

15. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.

Numerous requests for help having recently reached the Secretary from the Allotment and Cottagers' Societies now springing up all over the Kingdom, the President and Council have responded by revising and extending the benefits offered to Affiliated Societies. It is hoped that all Societies will by Affiliation become united with the parent Society and through it with each other. Such a unity cannot fail to be attended with good and progressive results.

16. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1918 contains a considerable quantity of new information and is compiled more especially for the single-handed gardener. Fellows may obtain it from the R.H.S. Office, Vincent Square, London, S.W. 1; bound in art paper covers, without pencil, 1*s*. 3*d*., in cloth similar to the 1917 Edition, with pencil, 1*s*. 9*d*., in leather, 2*s*. 3*d*.; post free.

17. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s*. 9*d*., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W. 1.

18. R.H.S. FOOD PRODUCTION PUBLICATIONS FOR THE ASSISTANCE OF COTTAGE AND ALLOTMENT GARDEN SOCIETIES.

To assist the rapidly growing army of Allotment Holders and Cottage Gardeners the Society has had the following publications prepared :—

	Post free. *s. d.*
Rules and Regulations for Allotment Societies	1
Rules for Judging Cottage and Allotment Gardens	1
Companion Judges Sheet for ditto	3
Rules for Allotment and Vegetable Exhibitions	2
Vegetable Bottling and Fruit Preserving without Sugar, by Mr. and Mrs. Banks (including valuable recipes for Jams and Jellies)	1 2

Printed lectures, illustrated with lantern slides, have been prepared for the use of Societies of Allotment Holders. For particulars apply to the Secretary, R.H.S. Vincent Square, S.W. 1.

19. R.H.S. POPULAR PRACTICAL PAMPHLETS.

The following pamphlets can be ordered from the Royal Horticultural Society, Vincent Square, London, S.W. 1. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. The enormous increase in the cost of paper and printing has entailed a revision of the price of these Pamphlets which until further notice will be as follows :—

Single Copy, 4*d*.; 25, 7*s*. 6*d*.; 50, 14*s*.; 100, 26*s*., post free.

FOOD PAMPHLETS :—

(*e*) Vegetables and How to Grow Them.
(*f*) Vegetables from Seed sown in July and August.
(*q*) The Cultivation and Manuring of the Garden.
(*r*) Potatos in Gardens and Allotments.

(*v*) Cropping Allotments and Small Gardens.
(*a*) List of Hardy Fruits, with Cultivation.
(*c*) The Pruning of Fruit Trees.
(*b*) The Training of Fruit Trees.
(*d*) Keeping Fruit Trees Clean.
(*k*) Fruit and Vegetable Bottling and Storing.
(*m*) Vegetable Cookery.
(*n*) Salads and Salad Making.

OTHER GARDEN PAMPHLETS :—

(*g*) The Herbaceous Garden.
(*h*) The Rose Garden.
(*i*) Flowers for Small Gardens, Window Boxes, etc.
(*j*) Hardy and Half-Hardy Annuals in the Open Air.
(*o*) War-time Economy in Gardening.
(*p*) Medicinal Plants and their Cultivation.
(*s*) Fruit Cultivation under Glass.
(*t*) The Pruning of Hardy Shrubs.
(*u*) The Children's Garden.

200,000 of these Pamphlets have been sent out during 1917, making nearly 00,000 issued in all.

20. LIST OF THE MOST DESIRABLE VARIETIES OF FRUIT.

DRAWN UP BY THE FRUIT COMMITTEE.

Orders for this list may now be given. Its price is 2*s*. post free. It contains early 200 pages, and besides the original list drawn up by the Committee, it ives lists of varieties recommended by nearly 100 expert growers and gardeners ll over the country for their respective geographical divisions of Great Britain. he list shows the result of a ballot as to which varieties are to be preferred from uch points of view as vigour of constitution, and for various types of growth and ultivation, as, *e.g.*, in the case of Apples—Bush, Standard, Espalier ; Pears—ush, Standard, Espalier, Wall. It also shows the best varieties for cooking as stinct from dessert, the best for markets, and much similar detailed information hich must prove of great help in these days when the planting of more fruits s well as of more vegetables is so widely recognized as being of urgent necessity.

21. FRUIT BOTTLING FOR COTTAGERS.

A leaflet for the use of cottagers and small householders, on Fruit Bottling, as been prepared by the Secretary for free circulation. It can be had on application to the R.H.S. Office, Vincent Square, Westminster, S.W. 1, accompanied y a halfpenny *stamped* and *addressed* envelope. Owing to shortness of staff, ay application not thus made cannot receive attention.

22. BOOK ON FRUIT AND VEGETABLE BOTTLING.

Fellows of the Society have shown exceptional interest in the long series of lectures given during this year at the Fortnightly Meetings by Mr. and Mrs. incent Banks on Fruit and Vegetable Bottling, who have now, in response to many requests, prepared a book on the subject. The Council, recognizing the value of the information it contains, and the demand for instruction of this kind, have published it. It contains the most up-to-date information on the subject and is most practical. It deals not only with the Bottling of both Fruits and Vegetables, but also with the making of Jam, and the pulping of Fruit to be made into Jam later on, when sugar supplies are more abundant than they are just now. There are also many useful household recipes, and all the information given is the result of the actual experience of the authors extending over a long number of years. Mr. and Mrs. Banks' exhibits of Bottled Fruits at the Society's Meetings are well known to the Fellows for their excellence. The price of the book, which may be obtained from the R.H.S., Vincent Square, London, S.W. 1, is 1*s*., post paid 1*s*. 2*d*. ; bound in stiff paper covers.

The 1918 Edition contains a Supplement on Drying and Canning.

23. R.H.S. WAR RELIEF FUND.

The work of the Society having greatly increased since the outbreak of the War and the staff having greatly diminished, the Council found that the management of this fund imposed far too great a demand upon the staff, a demand indeed which it was impossible to meet. A special Administrative Committee for the War Relief Fund was, therefore, appointed. The Committee is composed of Members of the Council, and of the Ladies' Executive Committee which has done such admirable work in collecting money for the fund. The Office of the Fund is at 17 Victoria Street, Westminster, S.W. 1, where all communications and donations should be addressed.

24. SHIRLEY POPPIES.

Owing to the great increase in the Society's work both in itself and on behalf of the Increase of Food Production of the Government, Mr. Wilks is unable to undertake the distribution of Poppy Seed this year. He has, therefore, given all his 1917 crop of seed to the Society, and it will be found listed with the other seeds in the Annual Distribution which takes place in March and April.

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